

BYTE

DECEMBER 1988

A McGRAW-HILL PUBLICATION

REVIEWS

Sun 386i
Dell System 220
QuickCapture
Merge 386
Agenda
MacDraw II

24
Plotters

PRODUCT FOCUS

The New Mac IIx

- 16-MHz 68030
- Built-in FPU
- Reads Mac
and DOS disks

IN DEPTH

Groupware

PLUS

Compaq 286 SLT
Benchmark Update
Open Look Unix
Better Screens
for Laptops
Avoiding Spreadsheet
Pitfalls

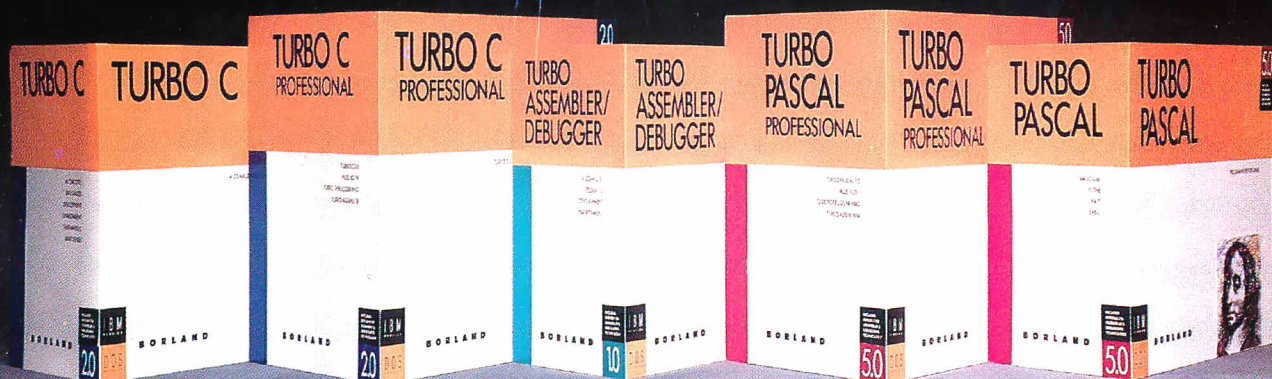


Macintosh IIx



\$3.50 U.S.A./\$4.50 IN CANADA
0360-5280

The Revolution continues with our new . . .



Turbo Assembler, Turbo D

What started modestly enough in November of 1983 with the launch of Borland's first program, Turbo Pascal® 1.0, became a revolution and it's been going like a rocket ever since.

We've changed the way you program.

We invented integrated environments with Turbo Pascal and we brought them to all our languages. Borland continues to bring you the best programming tools in the world.

New! Turbo Assembler & Turbo Debugger

Two state-of-the-art development tools in one package for only \$149.95.

New Turbo Debugger® debugs all sizes

With EMS support, remote debugging, and 386 virtual machine debugging, there's no limit to the size of program you can debug. In fact with 386 virtual machine mode, debugging takes **zero**, bytes of conventional memory!

See what's happening

Overlapping windows give you multiple views of the program you're debugging: source code, variables, CPU registers, call stack, watches, breakpoints, memory dump, and more. And a new "session-logging" feature tracks and records your every move.

You're in control

Our breakpoints give you more control than anyone else's. Ordinary debuggers only get you to a stop, then they stop. When our breakpoints are triggered you can simply stop, or you can print expressions, run code, send messages to the session log, or even evaluate an expression with user-defined function calls. And **all** our breakpoints are conditional.



Shown here are views of source code, CPU registers, watch expressions, and a session log.

Unique Data Debugging

Plain Vanilla debuggers can only give you **code** debugging. Our new Turbo Debugger give you **data** debugging too. You can browse through your data from the simplest byte to the hairiest data structure, inspect arrays, and walk through linked lists. All by point and shoot.

Feature highlights

Breakpoints

- Actions: stop, run code, log expression
- Break on condition, memory changed
- Software ICE capabilities
- 386 debug register support
- Support for hardware debuggers

Debug any program

- Turbo Pascal, Turbo C, Turbo Assembler
- EMS support
- 386 virtual machine and remote machine debugging
- Supports CodeView® and .MAP-compatible programs

Data Debugger

- Follow pointers through linked lists
- Browse through arrays and data structures
- Change data values

New Turbo Assembler® lets you write the tightest, fastest code

Turbo Assembler is faster than other assemblers, and you can use it on your existing code. It's fully MASM compatible, 4.0, 5.0, and 5.1; even MASM can't say that. Turbo Assembler takes you beyond MASM, with significant new Assembly language extensions, more complete error checking, and full 386 support.

Turbo Assembler is designed for easy interfacing with high-level languages like Turbo Pascal and Turbo C. We use Turbo Assembler on Quattro®, our best-selling spreadsheet program; now you can write your own best-seller with Turbo Assembler!

Feature highlights

- Faster than other assemblers
- MASM compatible (4.0, 5.0, and 5.1)
- Significant new assembly language extensions
- Easy interfacing with high-level languages including Turbo C and Turbo Pascal
- Full 386 support

TURBO DEBUGGER

FEATURE COMPARISON

	TURBO DEBUGGER	CodeView®
Multiple overlapping views	Yes	No
386 virtual-86 mode debugging	Yes	No
Remote debugging	Yes	No
Data debugging	Yes	Partial
Generalized breakpoints	Yes	No
Session logging	Yes	No
Conventional memory used—80386	Zero K	230K
Conventional memory used—remote	15K	N/A

Turbo Debugger version 1.0, Microsoft CodeView version 2.2.

TURBO ASSEMBLER

BGIDEMO BENCHMARK

	TURBO ASSEMBLER	Microsoft® Assembler
Assembly time (seconds)	9.34	27.46
Link time (seconds)	4.15	10.51

FEATURE COMPARISON

	TURBO ASSEMBLER	Microsoft® Assembler
MASM compatible (4.0, 5.0, 5.1)	Yes	No
Thorough type checking	Yes	No
Nested structures and unions	Yes	No
Multimodule cross reference	Yes	No
Assemble multiple files	Yes	No

Run on IBM PS/2 model 60 using Turbo Assembler version 1.0, Turbo Linker version 2.0, Microsoft Macro Assembler version 5.10, Microsoft Overlay Linker version 3.64.

Debugger, Turbo Pascal 5.0

New! Turbo C® 2.0 with integrated source-level debugger

New Turbo C 2.0 is the *one* C compiler that does it all; nothing is half done or not done at all—instead, your every programming need is met. We wrote our best-selling word processor Sprint® with Turbo C; now you can write your own best seller with Turbo C 2.0.

At better than 16,000 lines a minute,* Turbo C 2.0 compiles your code 20-30% faster than its predecessor Turbo C 1.5 which was already faster than any other C compiler.

Make bugs bug off

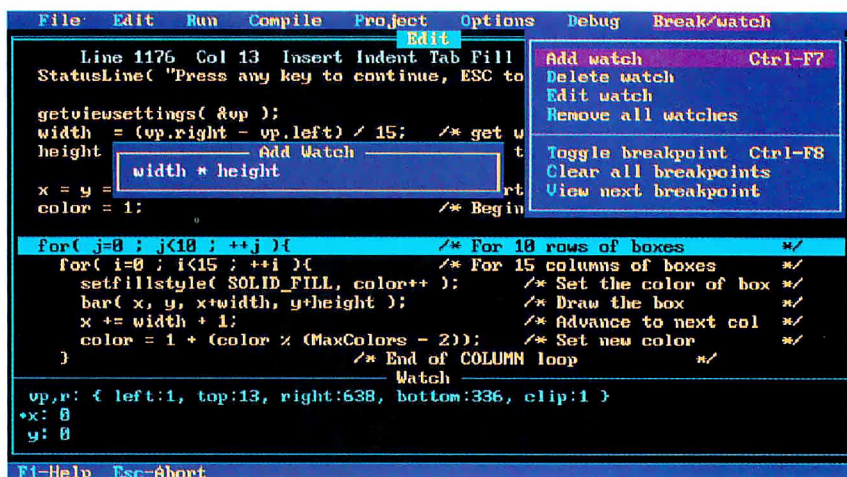
Nice bugs are dead bugs, and Turbo C 2.0's integrated source-level debugger lets you find them and flatten them in a flash. You can set multiple breakpoints, watch variables and evaluate expressions—all from inside your integrated C environment.

Minimum system requirements: For the IBM PS/2™ and the IBM® family of personal computers and all 100% compatibles. PC-DOS (MS-DOS) 2.0 or later. Turbo Debugger minimum 384K. Turbo Assembler minimum 256K. Turbo C and Turbo Pascal minimum 448K (256K comment line version).

*Customer satisfaction is our main concern; if within 60 days of purchase this product does not perform in accordance with our claims, call our customer service department, and we will arrange a refund.

Prices and specifications subject to change without notice.

All Borland products are trademarks or registered trademarks of Borland International, Inc. Other brand and product names are trademarks or registered trademarks of their respective holders. Copyright ©1988 Borland International, Inc. BI 1290



Debugging in the Turbo environment: shown here an expression is being added to the Watch window in Turbo C. The Execution Bar highlights the next line the debugger will execute.

TURBO C 2.0

HEAPSORT BENCHMARK	TURBO C 2.0	Microsoft® C 5.1
.OBJ size (bytes)	843	945
.EXE size (bytes)	6896	7731
Execution time (seconds)	8.1	12.2

FEATURE COMPARISON

Integrated debugger	Yes	No*
Inline assembly	Yes	No
Auto dependency checking	Yes	No
EMS support for edit buffer	Yes	No
Device-independent graphics	Yes	No
Number of memory models	6	5
Price	\$149.95	\$450.00

Heapsort compiled with full optimization. Benchmark run on an IBM PS/2 Model 60.

*Integrated debugger included with Quick C.

Turbo C and Turbo Pascal owners, upgrade now! CALL (800) 543-7543

If you're a registered Turbo C and/or Turbo Pascal owner, you can upgrade and get the latest version of your favorite language, plus both Turbo Assembler and Turbo Debugger, all at special upgrade prices. Whether you order by phone or mail, be sure to include your old Turbo Pascal and/or Turbo C serial numbers and the code PL02.

Mail coupon to: Borland, Attn: Dept. PL02, 1800 Green Hills Road,
P.O. Box 660005, Scotts Valley, CA 95066-0005.

UPGRADE OFFERS For registered Turbo Pascal® and Turbo C® owners!
(Unregistered owners, see below*)

Name

Shipping address

City State Zip

Telephone

To qualify for the upgrade price you must give the serial number of the equivalent product you are upgrading.

Turbo Pascal Serial Number

Turbo C Serial Number

Upgrades for registered Turbo C and Turbo Pascal owners

Please check box(es)

1 <input type="checkbox"/> Turbo C 2.0 Professional (Includes both Turbo Assembler and Turbo Debugger)	250.00	99.95
2 <input type="checkbox"/> Turbo Pascal 5.0 Professional (Includes both Turbo Assembler and Turbo Debugger)	250.00	99.95
3 <input type="checkbox"/> Turbo Pascal with 5.0 upgrade manual and disks	N/A	49.95
4 <input type="checkbox"/> Turbo C with 2.0 upgrade manual and disks	N/A	49.95

Please specify diskette size: Either ☐ 5¼" OR ☐ 3½"

Total product amount \$

CA and MA residents add sales tax \$

In US please add \$5 shipping/handling for each product \$

In Canada please add \$10 shipping/handling for each product \$

Total amount enclosed \$

Payment: ☐ VISA ☐ MC ☐ Check ☐ Bank Draft Credit card expiration date:

Card #

Name as it appears on card

*If you have not registered your Turbo Pascal or Turbo C, you may qualify for the special price by including your completed registration card with this coupon and payment. Offer good September 1 through November 30, 1988. Coupon must be postmarked before December 31, 1988. Offer good in U.S. and Canada only. This offer limited to one upgrade per valid product serial number. Not good with any other offer from Borland. CODs and purchase orders will not be accepted by Borland.

Circle 39 on Reader Service Card (DEALERS: 40)

and Turbo C 2.0!

Turbo C 2.0 has the best of everything

- Includes the compiler, editor, and debugger, all rolled into one
- Integrated source-level debugger lets you step code, watch variables, and set breakpoints
- Develop and debug production-quality code in all six memory models
- Inline assembler support
- Support for Turbo Assembler and Turbo Debugger
- Make facility with automatic dependency checking
- Over 430 library functions, including a complete graphics library
- Only \$149.95

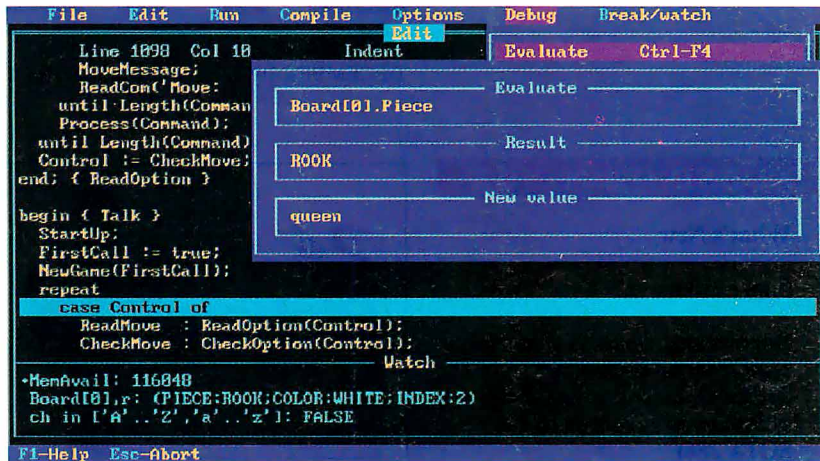
New Turbo C Professional

Turbo C 2.0 plus *both* Turbo Assembler & Turbo Debugger: all three programs rolled into one—the *one* C package that has everything. A complete set of tools that caters to every level of programming expertise. Turbo C Professional: \$250.

New! Turbo Pascal® 5.0 with integrated source-level debugger

Turbo Pascal, the worldwide favorite with over a million copies in use, just got even smarter. The best got better. Meet Version 5.0. In a word, it's revolutionary.

Not only do you go code-racing at more than 34,000 lines a minute,* you also now go into a sophisticated debugging environment—right at source level.



Shown here is the Evaluate/Modify window of Turbo Pascal: look at expressions, examine structured data types, change variables on the fly.

It's completely integrated and bullet-fast.

Turbo Pascal's new integrated debugger takes you inside your code for fast fixes. You step, trace, set multiple breakpoints. You modify variables as you debug and watch full expressions at runtime.

Separate Compilation

Break your code into units. Your separately compiled units can be shared by multiple programs and linked in a flash with Turbo Pascal's built-in Make utility and smart linker. We give you a powerful library of standard units including the spectacular Borland Graphic Interface and our state-of-the-art overlay manager.

Feature highlights

- Includes the compiler, editor, and debugger, all rolled into one
- Integrated source-level debugger lets you step code, watch variables, and set breakpoints
- Overlays, including EMS support
- 8087 floating-point emulation
- Support for Turbo Assembler and Turbo Debugger
- Procedural types, variables, and parameters
- Smaller, tighter programs: Smart Linker strips both unused code and data
- Constant expressions
- EMS support for editor
- Only \$149.95

Debugging: The inside story

Turbo Pascal's new integrated source-level debugger takes you inside your code to fix errors fast. Don't worry about errors, everyone makes them; but with the right debugger, this one, it's a fast fix.

Turbo Pascal Professional®

Turbo Pascal 5.0 plus *both* Turbo Assembler & Turbo Debugger: all three programs rolled into one—the *one* Pascal package that has everything. A complete set of tools that caters to every level of programming expertise. Turbo Pascal Professional: \$250.

TURBO PASCAL 5.0	TURBO PASCAL 5.0	Turbo Pascal 4.0
SIEVE BENCHMARK		
.EXE size (bytes)	1440	1504
Execution time (seconds)	6.15	7.25
FEATURE COMPARISON		
Integrated debugger	Yes	No
Overlays, including EMS support	Yes	No
8087 floating-point emulation	Yes	No
Turbo Debugger support	Yes	No
Procedural types, variables, parameters	Yes	No
Smart linking of code and data	Yes	No
Constant expressions	Yes	No
EMS support for editor	Yes	No

Benchmark (25 iterations) run on an IBM PS/2 Model 60.

60-day money-back guarantee†

BORLAND
Circle 41 on Reader Service Card (DEALERS: 42)

For the dealer nearest you
Call (800) 543-7543

BYTE

DECEMBER 1988

VOL. 13/NO. 13

PRODUCTS IN PERSPECTIVE

67 What's New

97 Short Takes

Boomerang, bounces your system back from power failures
Think C, an improved version of Symantec's Lightspeed C
SOTA 286i, a new accelerator card
ALPS Allegro 24, a low-cost dot-matrix printer
FamilyCare Software, helps diagnose children's medical problems

FIRST IMPRESSIONS

107 At Long Last, Laptop

by Frank Hayes

The Compaq 286 SLT advances the art of the laptop with a high-resolution display and battery-boosting technology.

REVIEWS

162 Product Focus: Plotters in Perspective

by Stanford Diehl
and Steve Apiki

For many applications, the pen plotter can't be beat.

183 The Sun386i

by John Unger

This Unix/DOS hybrid behaves like a multitasking personal computer.

193 A Nimble AT

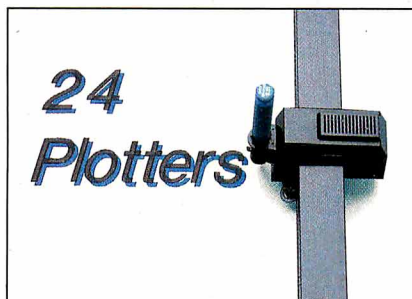
by Jeff Holtzman

Dell's System 220 marks the high end of AT compatibles.

199 A Quick Look at QuickCapture

by Joel West
and Dwight Newton

A convenient way to create and manipulate gray-scale images on the Mac.



Pen Plotters/162

EXPERT ADVICE

113 Computing at Chaos Manor: Seeing Red

by Jerry Pournelle

Reminiscent of an episode of *Lost in Space*, Jerry's machines turn on him.

137 Applications Plus: Crash!

by Ezra Shapiro

A hard disk wipeout points up the Mac's fragility.

141 Down to Business: Do You Really Need a LAN?

by Wayne Rash Jr.

Not every office needs a LAN. A printer server might be a less expensive alternate.

145 Macinations: VLSI Design and Network Help

by Don Crabb

A CAD package and a network management utility could be just the tools you're looking for.

149 COM1: X.400 Grows Up

by Brock N. Meeks

The final version of this international standard should advance global E-mail interconnectivity.

155 OS/2 Notebook: OS/2 Consumerism

by Mark Minasi

Fake software, fake hardware, and virtual memory revisited.

207 Merge 386

by Jeff Holtzman

Run Unix and DOS simultaneously on an 80386-based PC.

215 Slick

by Namir Clement Shammass

A sophisticated text-editing environment for programmers.

223 The Database Redefined

by Lamont Wood

Lotus' Agenda takes a flexible approach to database construction.

231 MacDraw II

by Rusel DeMaria

This graphics tool offers new drawing features and an improved user interface.

236 Review Update:

Benchmarks at a Glance

Six months' worth of system tests.

IN DEPTH

242 Introduction: Groupware

245 Working Together

by Douglas Engelbart
and Harvey Lehtman

New technologies necessitate evolution in the way we work in local and geographically distributed groups.

256A Where the Action Is

by Terry Winograd

A theory of human language facilitates the design of computer-supported cooperative work.

261 Perils and Pitfalls

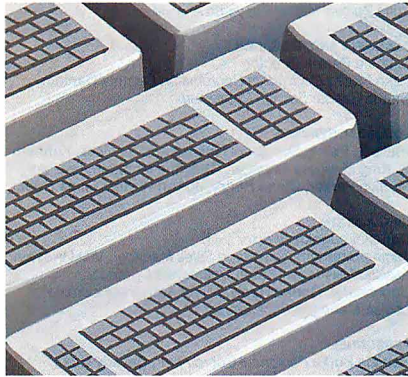
by Jonathan Grudin

You can implement useful groupware applications if you can clear these hurdles.

**COVER STORY AND
MACINTOSH SUPPLEMENT
begins after page 240**



- 267 Intelligent Software Agents**
*by Kevin Crowston
and Thomas W. Malone*
Applying artificial-intelligence
techniques to groupware
promises to alter the way
we organize our work.
- 275 A Groupware Toolbox**
by Susanna Oppen
A sampling of the more
popular and promising
groupware programs
now available.



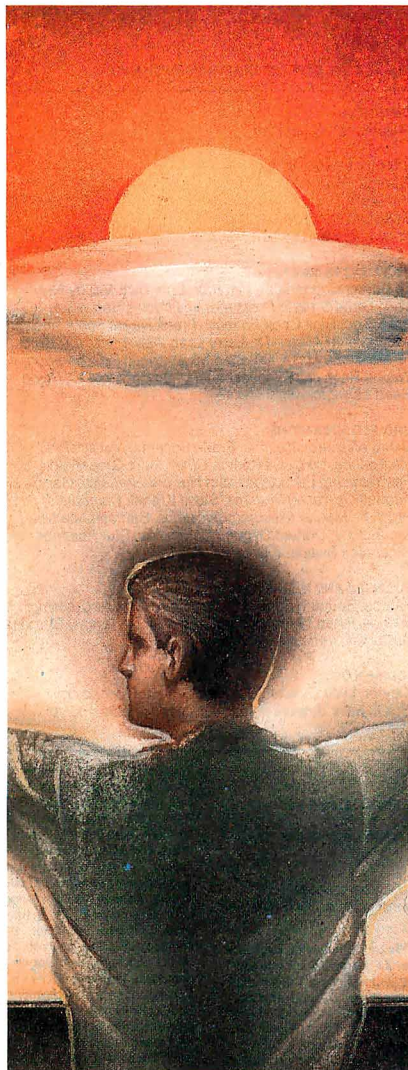
Groupware/245

HANDS ON

- 327 Ciarcia's Circuit Cellar:
A Supercomputer, Part 3**
by Steve Ciarcia
A look at the hardware's
nuts and bolts and also
at the driver program.
- 341 Some Assembly Required:
An Overview of Overlays**
by Rick Grehan
When programs are bigger
than memory allows, overlays
provide breathing room.

FEATURES

- 286 Face to Face with Open Look**
by Tony Hoeber
Can a new graphical interface
make Unix friendly
after all these years?
- 299 Lies, Damned Lies,
and Spreadsheets**
by Ronald Pearson
In software, as in statistics,
all that computes is
not the truth.
- 307 Untangling Pascal Strings**
by Dick Pountain
Here's a set of functions
that provides Pascal
with neat, efficient string
handling.
- 315 The CD-ROM Connection**
by Tim Oren
Read-only optical disks may
be the ideal medium for large
hypertext databases.
- 321 Light, Bright, and White**
by Wayne Rash Jr.
Backlit, supertwist LCD
technology gives computer
displays a bright new look.



Open Look/286

DEPARTMENTS

- 6** Editorial: Lisa Lives
11 Microbytes
24 Letters
33 Chaos Manor Mail
40 Ask BYTE
51 Book Reviews
387 Coming Up in BYTE

READER SERVICE

- 386** Editorial Index by Company
388 Alphabetical Index to Advertisers
390 Index to Advertisers
by Product Category
Inquiry Reply Cards: after **392**

PROGRAM LISTINGS

From BIX: see **284**
From BYTEnet:
call (617) 861-9764
On disk or in print:
see card after **320**

BYTE (ISSN 0360-5280) is published monthly with an additional issue in October by McGraw-Hill, Inc. Postmaster: Send address changes, USPS Form 3579, undeliverable copies, and fulfillment questions to BYTE Subscriptions, P.O. Box 551, Hightstown, NJ 08520. Second-class postage paid at Peterborough, NH 03458 and additional mailing offices. Postage paid at Winnipeg, Manitoba. Registration number 9321. Printed in the United States of America.

Not responsible for lost manuscripts or photos. Opinions expressed by the authors are not necessarily those of BYTE.

Copyright © 1988 by McGraw-Hill, Inc. All rights reserved. Trademark registered in the United States Patent and Trademark Office.



Subscription questions or problems should be addressed to: BYTE Subscriber Service, P.O. Box 551, Hightstown, NJ 08520.

BYTE

EDITOR IN CHIEF
Frederic S. Langa

OPERATIONS
Glenn Hartwig *Associate Managing Editor*

REVIEWS (Hardware, Software, Product Focus)
Dennis Allen *Senior Technical Editor, Software*, Stephen Apiki *Testing Editor, BYTE Lab*, Stanford Diehl *Testing Editor, BYTE Lab*

NEWS AND TECHNOLOGY (Microbytes, What's New, Short Takes)
Rich Malloy *Associate Managing Editor*, D. Barker *Senior Editor, News and Technology*, Anne Fischer *Senior Editor, New Products*, Andrew Reinhardt *Associate News Editor*

Peterborough: Roger Adams *Associate News Editor*, David Andrews *Associate News Editor*, Martha Hicks *Associate News Editor*

West Coast: Gene Smarte *Bureau Chief*, Costa Mesa, Nicholas Baran *Technical Editor*, San Francisco, Frank Hayes *Associate News Editor*, Marlene Nesary *Associate News Editor*, Jeffrey Bertolucci *Editorial Assistant*, San Francisco

SENIOR TECHNICAL EDITORS
Ken Sheldon *Features*, Jane Morrill *Tazelaar In Depth*, Richard Grehan *At Large*, Tom Thompson *At Large*

TECHNICAL EDITORS
Janet J. Barron, Janet Fiderio, Ben Smith, Jon Udell, Stanley Wszola

ASSOCIATE TECHNICAL EDITOR
Robert Mitchell

CONSULTING EDITORS
Jerry Pournelle, Ezra Shapiro, Don Crabb, Brett Glass, Brock N. Meeks, Mark Minasi, Wayne Rash Jr.

CONTRIBUTING EDITORS
Jonathan Amsterdam *Programming Projects*, Mark Dahmke *Video, Operating Systems*, Mark Haas *At Large*, Rik Jadrnicek *CAD, Graphics, Spreadsheets*, Robert T. Kurosaka *Mathematical Recreations*, Alastair J. W. Mayer *Software*, Stan Miastkowski *New Technology*, Alan R. Miller *Languages and Engineering*, Dick Pountain *Algorithms*, Roger Powell *Computers and Music*, Phillip Robinson *Semiconductors*, Jon Shiell *High-Performance Systems*, Ernest Tello *Artificial Intelligence*

COPY EDITORS
Lauren Stickler *Chief*, Susan Colwell, Jeff Edmonds, Judy Grehan, Nancy Hayes, Cathy Kingery, Margaret A. Richard, Warren Williamson

EDITORIAL ASSISTANTS
Peggy Dunham *Office Manager*, Linda C. Ryan, June N. Sheldon, Lynn Susan Valley

ART
Nancy Rice *Director*, Joseph A. Gallagher *Assistant Director*, Jan Muller *Assistant*, Alan Easton *Technical Artist*

PRODUCTION
David R. Anderson *Director*, Virginia Reardon *Senior Editorial Production Coordinator*, Denise Chartrand *Editorial Production Coordinator*, Michael J. Lonsky *Editorial Production Coordinator*

TYPOGRAPHY
Sherry Fiske *Systems Manager*, Donna Sweeney *Applications Manager*, Christa Patterson

ADVERTISING/PRODUCTION (603) 924-6448
Lisa Wozmak *Director*, Lyda Clark *Senior Account Coordinator*, Karen Cilley, Linda Fluhr, Jeanne Gatcombe, Brian Higgins, Rod Holden, Wai Chiu Li *Quality Control Manager*, Julie Murphree *Advertising/Production Coordinator*

EDITORIAL AND BUSINESS OFFICE:
One Phoenix Mill Lane, Peterborough, NH 03458, (603) 924-9281.
West Coast Branch Offices: 425 Battery St., San Francisco, CA 94111, (415) 954-9718; 3001 Red Hill Ave., Building #1, Suite 222, Costa Mesa, CA 92626, (714) 557-6292.
New York Branch Editorial Office: 1221 Avenue of the Americas, New York, NY 10020, (212) 512-3175.
BYTEnet: (617) 861-9764 (set modem at 8-1-N or 7-1-E; 300 or 1200 baud).
Fax: (603) 924-7507. **Telex:** (603) 924-7861.
SUBSCRIPTION CUSTOMER SERVICE: Outside U.S. (609) 426-7070; Inside U.S. (800) 525-5003.
For a new subscription—(800) 257-9402 U.S. only, or write to BYTE Subscription Dept., P.O. Box 555, Hightstown, NJ 08520.

Officers of McGraw-Hill Information Services Company: President: Walter D. Serwatka. Executive Vice Presidents: Kenneth E. Gazzola, Aerospace and Defense; Ira Herenstein, Computers and Communications; Russell C. White, Construction; Robert P. McGraw, Healthcare; Brian H. Hall, Legal. Senior Vice Presidents—Publishers: Laurence Altman, Data Communications; David J. McGrath, Engineering News-Record. Senior Vice Presidents: Robert D. Daleo, Finance; Michael J. Koeller, Human Resources. Group Vice Presidents: J. Burt Totaro, BYTE; Norbert Schumacher, Energy/Process Industries. Vice Presidents: George Elsinger, Circulation; Julia Lenard, Systems Planning and Technology. Officers of McGraw-Hill, Inc.: Joseph L. Dionne, Chairman, President, and Chief Executive Officer; Robert N. Landes, Executive Vice President, General Counsel, and Secretary; Robert J. Bahash, Executive Vice President and Chief Financial Officer; Frank D. Penglase, Senior Vice President, Treasury Operations.

ADMINISTRATION
Donna Nordlund *Publisher's Assistant*

MARKETING COMMUNICATIONS
Horace T. Howland *Director*, Pamela Petrakos-Wilson *Promotion Manager*, Wilbur S. Watson *Marketing Services Manager*, Dawn Matthews *Public Relations Manager*, Lisa Jo Steiner *Marketing Assistant*, Stephanie Warnesky *Marketing Art Director*, Sharon Price *Associate Art Director*, Julie Perron *Market Research Analyst*

PLANNING AND RESEARCH
Michele Perron *Director*
Faith Kluntz *Copyrights Coordinator*, Cynthia Damato *Sands Reader Service Coordinator*

FINANCIAL SERVICES
Philip L. Penny *Director of Finance and Services*, Kenneth A. King *Business Manager*, Christine Monkton *Assistant*, Marilyn Parker, Diane Henry, JoAnn Walter, Jaime Huber

CIRCULATION
Dan McLaughlin *Director*
James Bingham *Newsstand Sales Manager*, Vicki Weston *Assistant Manager*, Karen Desroches *Distribution Coordinator*, Donna Healy, *Direct Accounts Coordinator*, Louise Menegus *Back Issues*

PERSONNEL
Patricia Burke *Personnel Coordinator*, Beverly Goss *Receptionist*

BUILDING SERVICES
Tony Bennett *Manager*, Cliff Monkton, Mark Monkton, Agnes Perry

BIX BYTE INFORMATION EXCHANGE

DIRECTOR
Stephen M. Laliberte

EXECUTIVE EDITOR
George Bond

ASSOCIATE EDITOR
Tony Lockwood

MICROBYTES DAILY
D. Barker *Coordinator*, Peterborough, Rich Malloy *New York*, Gene Smarte *Costa Mesa*, Nicholas Baran *San Francisco*, Rick Cook *Phoenix*, Frank Hayes *San Francisco*, Jason Levitt *Austin, TX*, Larry Loeb *Wallingford, CT*, Brock N. Meeks *La Mesa, CA*, Stan Miastkowski *Peterborough*, Wayne Rash Jr., Sue Rosenberg *Washington, DC*, David Reed *Lexington, KY*

GROUP MODERATORS
David Allen *Applications*, Frank Boosman *Artificial Intelligence*, Leroy Casterline *Other*, Marc Greenfield *Programming Languages*, Jim Howard *Graphics*, Gary Kendall *Operating Systems*, Steve Krenek *Computers*, Brock N. Meeks *Telecommunications*, Barry Nance *New Technology*, Donald Osgood *Computers*, Sue Rosenberg *Other*, Jon Swanson *Chips*

BUSINESS AND MARKETING
Patricia Bausum *Secretary*, Denise A. Greene *Customer Service*, Brian Warnock *Customer Service*, Tammy Burgess *Customer Credit and Billing*

TECHNOLOGY
Clayton Lisle *Director*, Business Systems Technology, ISCO., Fred Strauss *Senior Business Systems Analyst*

PUBLISHER/GROUP VICE PRESIDENT
J. Burt Totaro

ADVERTISING SALES
Steven M. Vito *Associate Publisher*, Vice President of Marketing

Dennis J. Riley *Eastern Regional Sales Manager*
Sandra Foster *Administrative Assistant*

Jennifer L. Bartel *West Coast Sales Manager*, (214) 644-1111

NEW ENGLAND
ME, NH, VT, MA, RI, ONTARIO, CANADA & EASTERN CANADA
John C. Moon (617) 262-1160

ATLANTIC
NY, NYC, CT, NJ (NORTH)
Leah G. Rabinowitz (212) 512-2096
(203) 968-7111

EAST
PA, KY, NJ (SOUTH), MD, W. VA, DE, DC
(215) 496-3833

SOUTHEAST
NC, SC, GA, FL, AL, TN, VA
Thomas H. Tolbert (404) 252-0626

MIDWEST
IL, MO, KS, IA, ND, SD, MN, WI, NE, IN, MI, MS, OH
(312) 751-3740

SOUTHWEST, ROCKY MOUNTAIN
CO, WY, OK, TX, AR, LA
Karl Heinrich (713) 462-0757

SOUTH PACIFIC
SOUTHERN CA, AZ, NM, LAS VEGAS
Jack Anderson (714) 557-6292
Tom Harvey (213) 480-5243

NORTH PACIFIC
HI, WA, OR, ID, MT, NORTHERN CA, NV (except LAS VEGAS), UT, WESTERN CANADA
Bill McAfee (415) 349-4100
(415) 362-4600

TELEMARKETING
L. Bradley Browne *Director*
Susan Boyd *Administrative Assistant*

Elisa Lister (603) 924-6830

Liz Coyman (603) 924-9281

BYTE BITS (2x3)
Dan Harper (603) 924-6830

THE BUYER'S MART (1x2)
Mark Stone (603) 924-3754

REGIONAL ADVERTISING SECTIONS
Scott Gagnon (603) 924-4380
Larry Levine (603) 924-4379

BYTE DECK MAILINGS
National
Ed Ware (603) 924-6166

A/E/C COMPUTING DECK
COMPUTING FOR ENGINEERS DECK
Mary Ann Goulding (603) 924-9281

INTERNATIONAL ADVERTISING SALES STAFF
See listing on page 389.

Founder: James H. McGraw (1860–1948). Executive, editorial, circulation, and advertising offices: One Phoenix Mill Lane, Peterborough, NH 03458, phone (603) 924-9281. Office hours: Monday through Thursday 8:30 AM–4:30 PM, Friday 8:30 AM–1:00 PM, Eastern Time. Address subscriptions to BYTE Subscriptions, P.O. Box 551, Hightstown, NJ 08520. Subscriptions are \$22.95 for one year, \$39.95 for two years, and \$55.95 for three years in the U.S. and its possessions. In Canada and Mexico, \$25.95 for one year, \$45.95 for two years, \$64.95 for three years. \$75 for one-year air delivery to Europe. \$28,800 for one-year air delivery to Japan. \$14,400 for one-year surface delivery to Japan, \$40 surface delivery elsewhere. Air delivery to selected areas at additional rates upon request. Single copy price is \$3.50 in the U.S. and its possessions, \$3.95 in Canada, \$4.50 in Europe, and \$5 elsewhere. Foreign subscriptions and sales should be remitted in U.S. funds drawn on a U.S. bank. Please allow six to eight weeks for delivery of first issue. Address editorial correspondence to: Editor, BYTE, One Phoenix Mill Lane, Peterborough, NH 03458. Unacceptable manuscripts will be returned if accompanied by sufficient postage. Where necessary, permission is granted by the copyright owner for libraries and others registered with the Copyright Clearance Center (CCC) to photocopy any article herein for the flat fee of \$1.50 per copy of the article or any part thereof. Correspondence and payment should be sent directly to the CCC, 29 Congress St., Salem, MA 01970. Specify ISSN 0360-5280/83, \$1.50. Copying done for other than personal or internal reference use without the permission of McGraw-Hill, Inc. is prohibited. Requests for special permission or bulk orders should be addressed to the publisher. BYTE is available in microform from University Microfilms International, 300 North Zeeb Rd., Dept. PR, Ann Arbor, MI 48106 or 18 Bedford Row, Dept. PR, London WC1R 4EJ, England.

BYTE and **BYTE** are registered trademarks of McGraw-Hill, Inc.

Integrated Software for Schematics & PCB Artwork



Introducing HiWIRE®-Plus

Wintek's smARTWORK® pioneered low-cost printed-circuit-board CAD. Then HiWIRE set the standard for productivity and ease-of-use in schematic capture. Now Wintek introduces HiWIRE-Plus, integrating HiWIRE's schematic features with a powerful printed-circuit-design facility.

Creating Schematics

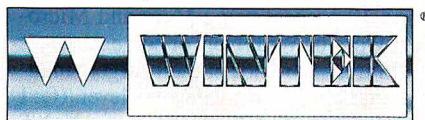
With HiWIRE-Plus, simply connect library symbols with wires and buses. Creating and changing symbols is fast and painless. Produce your drawing using a dot-matrix printer, laser printer, or pen plotter.

Circuit-Board Design

HiWIRE-Plus gives you all the design freedom you want: you choose the grid size, trace widths, and pad shapes. The board size and number of layers are virtually unlimited. HiWIRE-Plus is perfect for surface-mount, micro-strip, and ECL applications.

HiWIRE-Plus Advantages

- ☐ One tool for schematics and printed-circuit artwork
- ☐ Easy-to-learn menu-driven operation; complete documentation and tutorial
- ☐ Schematic libraries with TTL, CMOS, ECL, ladder, micro-processor, and discrete components
- ☐ Netlist and bill-of-materials utilities included
- ☐ Circuit boards up to 60x60 inches and 256 layers
- ☐ Variable grid size, trace width, and pad size (.001" resolution)
- ☐ PCB library with DIPs, SIPs, SMDs, PGAs, TOs, and edge and D connectors
- ☐ Schematic-to-layout cross-checking
- ☐ Design-rule checker
- ☐ 800 number for free support



"HiWIRE", "smARTWORK", "Wintek", and the Wintek logo are registered trademarks of Wintek Corporation.

System Requirements

- ☐ IBM PC, XT, AT, or PS/2 with 512K RAM, printer port, color monitor, and CGA, EGA, or VGA graphics card
- ☐ Microsoft Mouse
- ☐ IBM ProPrinter or Epson dot-matrix printer, and/or
- ☐ Houston Instrument or Hewlett-Packard pen plotter

Higher Performance Better Value

Still only \$895, HiWIRE-Plus delivers quality schematics and PCB artwork. You don't need to guess if HiWIRE-Plus is right for you—we *guarantee it!* Try it for 30 days at absolutely no risk. Call toll free today and put HiWIRE-Plus to work for you.

Wintek Corporation

1801 South Street
Lafayette, Indiana 47904-2993
(800) 742-6809 or
(317) 742-8428
FAX: (317) 448-4823
Telex: 70-9079

Europe: RIVA Ltd., England,
Phone: 0420 22666, FAX: 0420 23700
Australia: Entertainment Audio Pty, Ltd.,
Phone: (08) 363-0454

CURRENT VERSIONS
HiWIRE, V1.1r4; smARTWORK, V1.4r1

LISA LIVES

The NeXT cube bears some startling resemblances to an earlier innovative machine Steve Jobs once produced

Remember Apple's Lisa? We have one in our Lab, where it sits like a living fossil: a robust proto-Mac that has been superseded by its more gracile descendants.

It was a marvel of its day, embodying the characteristics that would evolve into today's smaller, faster, cheaper Macintoshes. And its influence has spread far into the non-Mac world: Windows, Presentation Manager, Open Look, Intuition, and other graphical environments all owe some debt to Lisa and the Mac.

Yet the Lisa itself was something of a commercial flop. It was too expensive ever to achieve the kind of critical mass needed to come into wide use, and it didn't cost enough to allow Apple to continue making it in relatively small quantities.

Now consider the NeXT computer. With powerful and innovative hardware coupled with an effortless user interface and perhaps the easiest-ever serious programming environment, it's a technological gem.

And the cube already is having an impact beyond its immediate venue. For example, IBM has licensed NextStep—the cube's Window Server, Application Kit, Display PostScript, and Workspace environment—so it's a safe bet that a NeXT-like environment will eventually show up on reduced-instruction-set computers and Intel-based machines bearing IBM's brand. Naturally, the clones will follow.

But the cube may also carry with it the same problem that proved the death of Lisa: It's simultaneously very expensive for a personal computer, yet possibly too inexpensive to survive as a low-volume specialty device.

Yes, it's true that several "mainstream" personal computers cost as much or even more than the NeXT cube does, but they have wide acceptance; they're proven, stable designs; they can be configured in endless variations and can run literally thousands of applications (as announced, there's not even a good way to load new software into the cube, except via the network connector in the back); and so on. The cube, being brand new, can counter these established strengths only with its bright promise.

The promise might be enough, especially given that the machine is targeted at some of the best, brightest, and most enthusiastic early adopters of new computer technology: students. But even here, reality adds its grain of salt: A cube costs as much as a semester at MIT. How many students can afford that?

A comment written by Mark Welch (a participant in BIX's NeXT conference) said it very well: "What type of student, exactly, is the NeXT cube aimed at?"

"I assume engineering and computer science students would drool over this [computer]. . . . But the students I know (the science types) are struggling really hard, or taking out the maximum \$2500 student loan to buy a Mac with enough goodies to make it usable. How, and why, would those students afford a NeXT system?"

"I assume I am not one of the target students (I am a law student, and about 50 percent or more of law students own PC clones running WordPerfect, with a good 10 percent using Macs and Microsoft Word or WriteNow or some such).

"Surely I am not in their target financial market, given my poverty level. (Q: I wonder if the \$6500 price tag of a NeXT workstation is above or below the average

[annual] income of a university student?)

"I do question, rather substantially, any theory that a student could buy a \$6500 computer, even over 4 years."

As I write this, less than a week after the formal announcement of the NeXT machine, lots of people are questioning it. Of course, the universities themselves might foot the bill, hiding the costs in the form of increased tuition, or maybe finding a way for benefactors to at least partially pick up the tab. But even here there's a snag: Remember that NeXT refuses to sell to anyone other than universities. Would you donate to your alma mater's computer fund, knowing that the money would go to buy computers that deliberately will be prevented from being used in the wider world outside academia?

Something here doesn't add up. To me, it looks as though a portion of Steve Jobs's history is going to replay itself. In the not-too-distant future, I think we'll see a less-expensive, equally capable NeXT machine that will be available outside academia. This machine will be to the cube as the Mac is to the Lisa.

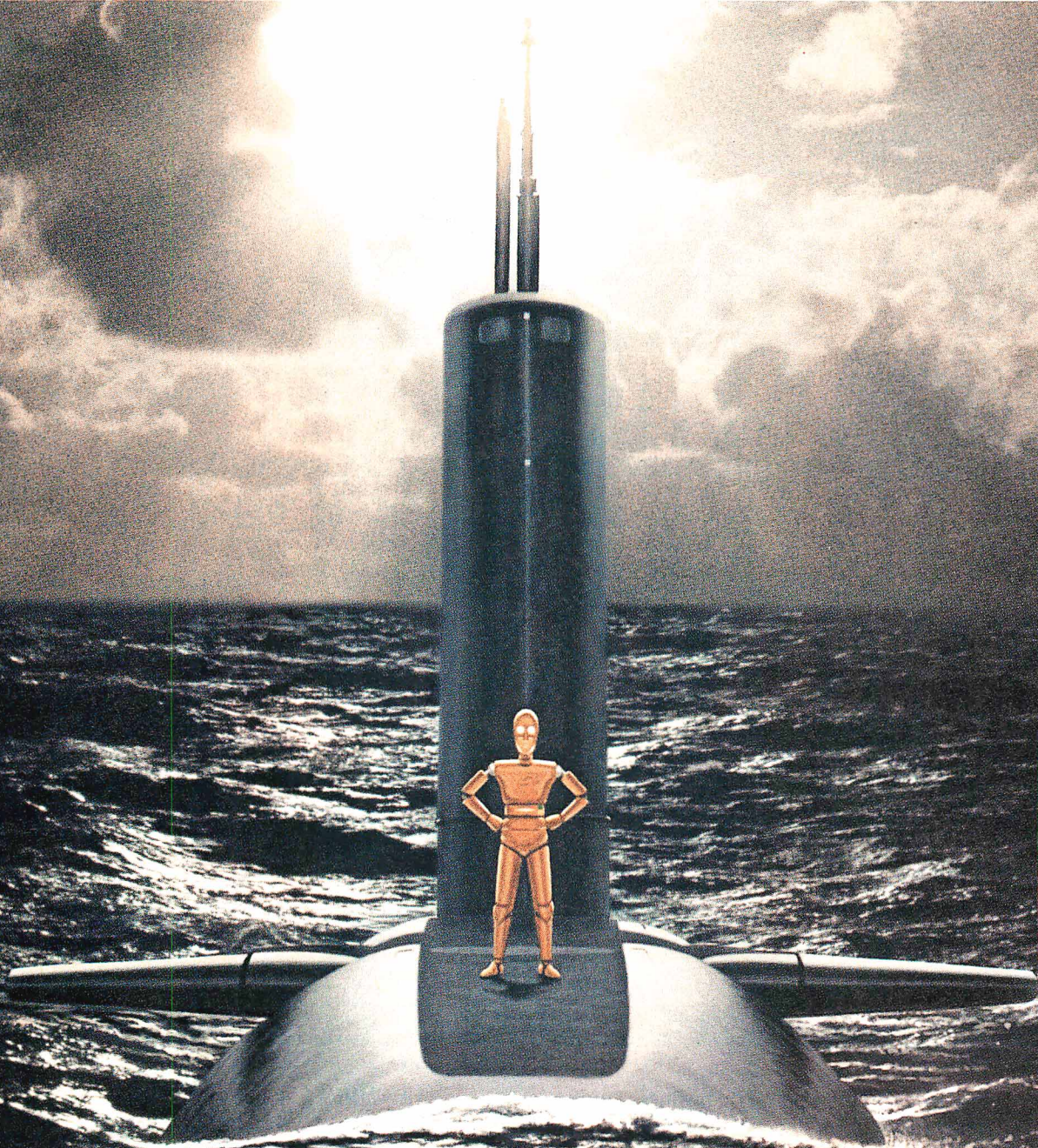
None of this is to suggest that we should write off the cube, or NeXT. The cube already is a technological success that will have far-reaching implications, no matter what happens in the marketplace. As such, it's a bellwether of computer technology that bears close scrutiny. And within one niche market—wealthy students and/or the best-endowed universities—it may also be a commercial success.

Actually, I hope it does succeed, because we all benefit from innovation, and the cube—like the Lisa before it—is truly innovative.

But as for getting and using one, well, I guess we'll just have to wait until NeXT or someone else produces a cube for, er, the rest of us.

—Fred Langa
Editor in Chief
(BIX name "flanga")

IBM/PC/XT/AT are registered trademarks of International Business Machines Corp. 688 ATTACK SUB is a trademark of Electronic Arts. Maxell Corp. of America, 2208 Route 206, Fair Lawn, NJ 07410.

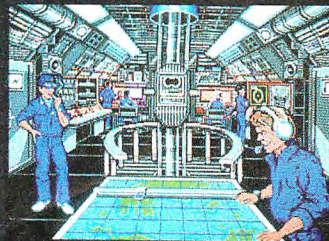


Play the game of the decade. Free.

It's a special Maxell edition of 688 Attack Sub™, Electronic Arts' brilliant new simulation game for IBM PC/XT/AT and most compatibles. You'll command a crew aboard a fully-equipped top-secret billion dollar sub. Hunt or evade intelligent foes. Thrill to highly realistic 3-D graphics (256 colors in VGA mode). It's irresistible, easy to operate and it's yours on the free 11th disk in specially-marked MD2-D and MD2-HD 10-packs at your Maxell dealer. Don't delay.



Command the con of 688 ATTACK SUB.



maxell®
THE GOLD STANDARD

PRESENTING AMERICA'S HOTTEST NEW CORPORATE JETS.

FIVESTAR'S fleet of powerful business computers have really taken off in the last three years. That's because they're built for corporations that want to get where they're going in a hurry.

We build a full line of high-powered performers that not only provide *total* PC compatibility and advanced business capabilities, but also offer American-made ingenuity, quality and value.

In fact, when you *really* compare, you'll find that FIVESTAR Computers leave the competition far behind.

FIVESTAR 286's. **The performance to fly through heavy workloads.**

FIVESTAR 286's provide the features and performance aggressive companies need to reach higher corporate goals. In fact, they're designed to run future as well as current operating systems.

The 286/10 is powered by an Intel 80286 microprocessor that operates at a fast 10 MHz, with zero wait states. With 640KB memory and 1.2MB floppy disk drive, you'll soar through today's popular business applications. Serial, parallel and game ports, and an enhanced 101-key keyboard, provide in-flight convenience.

The 286/14 is also powered by an Intel 80286 CPU, but operates at 14 MHz (with zero wait states) for even faster performance. It, too, comes equipped with 1024KB memory, 1.2MB floppy disk drive, serial/parallel/game ports and a 101-key keyboard. No doubt about it — it's a hot machine and a dream to fly!

FIVESTAR 386's. **Don't forget to fasten your seat belt.**

The incredible speed and power of FIVESTAR 386's have made them a leading choice of corporations across America for multitasking and sophisticated applications, including CAD. In fact, there's so much performance and value built into our 386's, it can take your breath away.

The 386/16 is fast. Very fast. That's because it features an Intel 80386 CPU operating at 16 MHz, with zero wait states. And its 1024KB memory and 1.2MB floppy disk drive will keep you airborne for long distances. Serial/parallel/game ports and a smooth performing 101-key keyboard are standard equipment.

Prices:
The 286/10 –
from \$1099.
The 286/14 –
from \$1499.



The 386/20. It's made for those who want to fly to the outer limits. With an Intel 80386 microprocessor operating at 20 MHz (with zero wait states) it'll move through the most complex applications with astounding ease. And you won't have to worry about running low on memory either. It not only features 1024KB of RAM and a 1.2MB floppy disk drive, it also has a 64KB cache memory. Naturally, it comes equipped with serial/parallel/game ports and a 101-key keyboard, too.

Customize your FIVESTAR to meet your own specifications.

All FIVESTAR 286 and 386 Computers are available with hard drives, from 20 to 320 MB, as well as a choice of monochrome, EGA, VGA or super-high resolution paper-white monitors. Whatever the requirement, FIVESTAR can meet it.

Prices:

**The 386/16 –
from \$1999.**

**The 386/20 –
from \$2999.**

**Unmatched reliability.
Unbeatable ground
support.**

Because every FIVESTAR Computer is tested and certified to meet the highest standards of quality, you can count on years of

reliable performance.

Once you've purchased your FIVESTAR computer, you'll get all the support you'll need. Just call our highly-trained service department *toll-free*. Most difficulties can be resolved within minutes.

For companies with critical applications, a comprehensive on-site service contract is available for just \$99. In most cases, service calls are made within 24 hours.

**Order by phone today.
And move your company to higher
levels of performance.**

To order a FIVESTAR 286 or 386 Computer, or for more information about our full line of high-powered computers, call us TOLL FREE. We'll have your hot new corporate jet parked in your hanger in no time!

1-800-752-5555

FIVESTAR
COMPUTERS

Circle 104 on Reader Service Card

America's hottest new corporate jets.

New Prices

OS/2

WINDOWS FOR DATA®

MULTI-LEVEL
MENU SYSTEM

NESTED
POP-UP FORMS

SCROLLABLE
REGION

CHOICE LIST

Invoices: Create Review Print Exit

INVOICE

Invoice No.: 008784 Date: 12/03/87 Time: 16:43:15

Customer: William Jones
Innovative Software
351 Bulletin Avenue
Needham, MA 02194
(617) 394-5512

Search for customer record? (Y/N): N
Enter customer information? (Y/N): N
Enter billing address? (Y/N): N
Enter marketing information? (Y/N): N

No.	PRODUCT	DESCRIPTION	QUANTITY	PRICE	AMOUNT
5	WDMS	Windows for Data Microsoft	10	295.00	2950.00
6	WDLA	Windows for Data Lattice	5	295.00	1475.00
7	WDTC	Windows for Data Turbo C	5	295.00	1475.00
8	WDXE	Windows for Data XENIX	2	795.00	1590.00
9			0	0.00	0.00

Subtotal: 11325.00
Shipping: 0.00
TOTAL: 11325.00
Payment: 0.00

Cursor keys scroll, ENTER selects and ESC exits choice menu

CLOCK

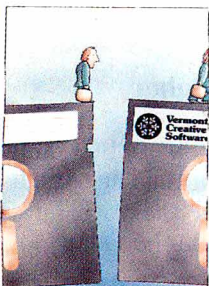
POP-UP
WINDOW

RUNNING
TOTALS

MESSAGE
WINDOW

If you program in C, take a few moments to learn how Windows for Data can help you build a state-of-the-art user interface.

- ✓ Create and manage menus, data-entry forms, context-sensitive help, and text displays — all within windows.
- ✓ Develop window-based OS/2 programs right now, without the headaches of learning OS/2 screen management. Run the same source code in PC DOS and OS/2 protected mode.
- ✓ Build a better front end for any DBMS that has a C-language interface (most popular ones do).



FROM END TO BEGINNING

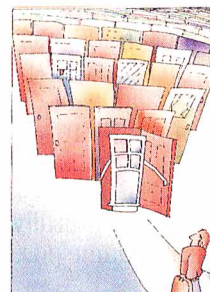
Windows for Data begins where other screen packages end, with special features like nested pop-up forms and menus, field entry from lists of choices, scrollable regions for the entry of variable numbers of line items, and an exclusive built-in debugging system.

NO WALLS

If you've been frustrated by the limitations of other screen utilities, don't be discouraged. You won't run into walls with Windows for Data. Our customers repeatedly tell us how they've used our system in ways we never imagined — but which we anticipated by designing Windows for Data for unprecedented adaptability. You will be amazed at what you can do with Windows for Data.

YOU ARE ALWAYS IN CHARGE

Control functions that you write and attach to fields and/or keys can read, compare, validate, and change the data values in all fields of the form. Upon entry or exit from any field, control functions can call up subsidiary forms and menus, change the active field, exit or abort the form, perform almost any task you can imagine.



OUR WINDOWS WILL OPEN DOORS

Our windows will open doors to new markets for your software. High-performance, source-code-compatible versions of Windows for Data are now available for PC DOS, OS/2, XENIX, UNIX, and VMS. PC DOS

versions are fully compatible with Microsoft Windows. **No royalties.**

MONEY BACK GUARANTEE

You owe it to yourself and your programs to try Windows for Data. If not satisfied, you can return it for a full refund.

Prices: PC DOS \$295, Source \$295. OS/2 \$395. XENIX \$1295. UNIX, VMS, please call.

Call: (802) 848-7731

Telex: 510-601-4160 VC SOFT

ext. 51

FAX 802-848-3502



**Vermont
Creative
Software**

21 Elm Ave.
Richford,
VT 05476

MICROBYTES

*Staff-written highlights of developments
in technology and the microcomputer industry*

OOPS Meets SQL in HP's Distributed Database System

Hewlett-Packard has been nursing an odd combo in its Palo Alto, California, research dens that may prove to be just the ticket for graphics-intensive database chores like CAD, CASE, and corporate publishing. Known as Iris, HP's prototype database mixes object-oriented programming methods and Structured Query Language (SQL) with relational algebra to produce a distributed database system. This technology could enable database management systems not just to store information, but to spot flaws and inconsistencies in the information as well.

Key to the real-world potential of Iris is its SQL module. SQL is already well-established as a database access language among corporate users. HP's object-ori-

ented variant, OSQL, capitalizes on the basic SQL syntax, substituting objects for field names in a query. The HP approach could, for example, enable administrative personnel in an engineering work group to use familiar query tools to extract cost or productivity data from an object-oriented database. Since the objects contain not only data but also procedures for handling that data, such a database could easily handle a wide variety of data, including different types of graphics images.

In some CAD applications, OSQL can be used to help find flaws in designs. For example, according to Thomas Ryan, HP's product manager for database technology, the system can be used to find bugs in circuit diagrams. "Imagine a cir-

cuit designer trying a command like this with a regular CAD system: 'Show me all the chips I haven't hooked wires to yet.' It can't be done."

HP demonstrated the technology at a recent object-oriented-programming convention in San Diego, California, and said it was basically testing the waters. If response is compelling enough, HP could kick Iris out of research and into marketing.

The company has no official timeline for commercialization. But according to Ryan, Iris has been essentially complete for 2 years. It currently runs on HP's Unix systems. Iris technology could be delivered on just about any computing platform, said Ryan. "That would be marketing's decision."

Three-Dimensional Display: They Do It with Mirrors

It's not a hologram, and you don't need specially polarized glasses to see it, but a three-dimensional image on the new SpaceGraph Display System appears to float in a black void under the hood of the massive (150-pound) unit. BBN Laboratories (Cambridge, MA) has developed this unique system that generates the images from any standard CAD files containing *x*, *y*, and *z* coordinates, such as those produced by CADkey or AutoCAD.

The heart of the \$30,000 SpaceGraph Display System is a 16-inch circular mirror that's made of 3-mm-thick acrylic. Thirty times a second, the mirror is alternately

deformed between concave and convex. What you see is the reflection of the face of the *x-y* display (the monitor mounted above). Because of the optics of curved mirrors, the CRT appears to move about 80 times as far as the center of the mirror actually moves, effectively creating a deep display from a tiny shift of the mirror. According to BBN scientist Lawrence Sher, it's effectively the same concept as the three-dimensional display your eye would see if you could oscillate a regular monitor back and forth 30 times a second. Because of the persistence of vision, your eyes "see" a true three-dimensional image.

The actual size of the visible display is a cube about 10 inches square, and the actual number of points that can be displayed in the visible area is 32,768. You can move your head about 30 degrees to either side of the mirror's center line, and within these limits, you can look over, under, and around the image.

BBN uses a unique method to oscillate the mirror: sound. The acrylic mirror is designed so that it resonates at exactly 30 Hz, and a loudspeaker mounted in back of the mirror provides the 30-Hz tone. Sher said it's essential that an absolutely pure 30-Hz tone be created,

continued

NANOBYTES

- The recent **price hikes by Apple** Computer (Cupertino, CA) drew more flack than any recent price changes we can recall. Users, even in the religious quarters of the Macintosh community, were steamed. Some few apologists justified the Mac's relatively high price as a result of Apple's considerable R&D investment, but most users felt the company went too far this time. **Mac owners** on BIX made it clear they were not happy; the messages commenting on the increases—which, for example, saw a 1-megabyte Mac II (with a 40-megabyte hard disk) jump from \$5369 to \$6169—were emphatically negative. Mac rooters felt the new prices make it tougher for their favorite machine to compete against IBM PC clones. An Apple spokesperson told us the increases were due to "many factors that are impacting our business, DRAM and component pricing among them." The DRAM defense was generally considered suspect, particularly since machines that use the same RAM did not go up in relative proportions.

- If we want to give computing power to the people who need it, we have to isolate them from the **confusion** of multiple hardware and software standards, **Borland International** (Scotts

continued

NANOBYTES

Valley, CA) president **Philippe Kahn** told the Capital Microcomputer Users Forum in Washington, DC, recently.

Things have gotten too confusing even in the Mac environment, Kahn said. "It's a mess. Now you can go and buy things and they won't work. You don't build products for functionality any more; you build them for check marks in product reviews."

- **Advanced Logic Research** (Irvine, CA), which makes some very fast IBM PC-compatibles, hopes to be the first company to bring to market a system based on the new **EISA** (Extended Industry Standard Architecture) specification. ALR is aiming for the second quarter of next year. Most other manufacturers have said that they will not have such a machine until the second half of 1989.

The ALR system, company officials said, will use a 33-MHz 80386 processor and have a 128K-byte memory cache and a **128-bit bus**, 64 more bits than the EISA specification calls for. It would presumably have 64-bit-wide buses for both data and addresses, and would thus be faster than the proposed normal EISA bus.

- Here's what **IBM** chairman **John Akers** had to say about the EISA gang. "We'll be trying to beat their brains out before they beat our brains out. Which is as it should be," he told a Yale University audience. "I gather that they [the EISA consortium] won't be introducing a product for at least a year," he said.

continued

both to move the mirror and to avoid harmonics that might be audible. The tone is stored as a digitized waveform on a ROM in SpaceGraph's interface board, and it's converted to frequency by a D/A converter. According to Sher, this is one of the major secrets for highly accurate control of the mirror's motion.

The display system's full-length interface board plugs into a 16-bit slot of any IBM PC AT or compatible computer. Because SpaceGraph uses a nonraster analog display, the board is packed with proprietary chips and four D/A converters. The unit comes with a command-driven program that performs some simple

format conversion on CAD files.

Sher said the U.S. Navy is using SpaceGraph to plot underwater weapon trajectories, and an aerospace firm is using it to graphically display finite element analysis. He said the price of SpaceGraph will drop when it goes into volume production.

When the Decade Turns: What's Ahead for the Industry?

As we get closer to the 1990s, the decade loses a little of its Flash Gordon sheen. It looks now like we won't all be walking around with wristwatch computers as powerful as the ones on our desks, with tiny screens showing full-motion video pictures sent through the air and controlled by software that's compatible with everything. (That stuff will have to wait for the late 1990s.)

After sitting through facts and figures and projections at a recent Dataquest-sponsored conference and consulting our own crystal ball, we have a more modest view of the next few years. And while we always view market projections cautiously and with a keg of salt nearby—as 3COM's Bill Krause joked, "They always start in the lower left-hand corner and go up at a 45 degree angle"—they provide at least a general picture of what's ahead.

Analysts at Dataquest forecast early-'90s growth in the industry at about 12 percent worldwide, and most of the hardware and software executives at the conference agreed. John Roach of Tandy said he didn't "like those figures worth a damn," but he expects his company to sell lots of equipment to a suddenly booming home-computer market. Europe is projected to be a slightly bigger market than the United States.

Most of the computers sold will still be based on Intel processors, except that the majority of systems will use the 80386, and the minority will use the 8088 and 8086 (a reversal of the current situation). Systems running on Motorola 680x0 processors will be popular but not predominant (Dataquest projects about 14 percent, but that could all change depending on the sales of Macintoshes, NeXT Computers, Suns, and so on.)

Laptops, which will continue to get lighter and yet more powerful, will finally tap into the market that's out there for portable computing, including satellite offices and roving personnel. The number of integrated circuits required to build a full-functioning personal computer could drop to about 40 by 1992, compared to 200 ICs used in the PC AT in 1982 and about 80 ICs in the PS/2 Model 50. Recent developments, such as the LEAP chip set from Chips & Technologies, better methods of building display screens, and lightweight, high-capacity disk drives—a new company called PrairieTek (Longmont, CO) has announced a 20-megabyte 2½-inch hard disk drive—point to improved laptops.

Networks will have to get easier to install and operate if the real world is to come anywhere near matching the forecasts that see scenarios

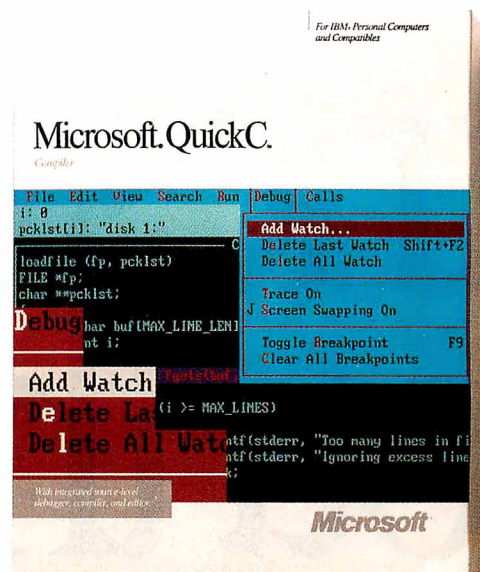
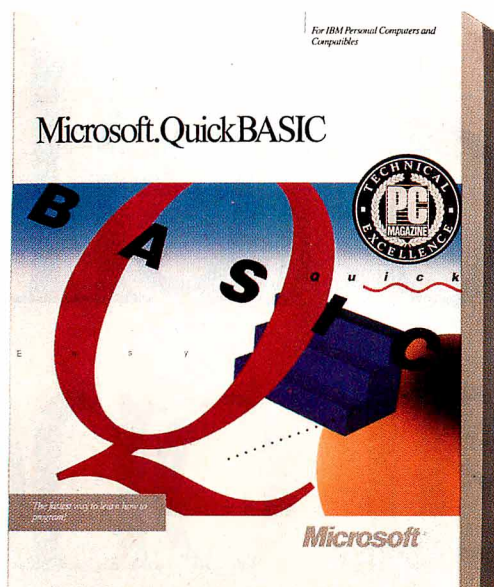
with 50 to 90 percent of all personal computers hooked into local-area networks (currently, it's 13 percent, Dataquest says). Major improvements in network throughput or bandwidth will take place in the next decade, 3COM's Krause says. Ethernet currently has a bandwidth of 10 megabits per second. According to Krause, Fiber Distributed Data Interchange (FDDI) technology will allow transfer rates of 100 megabits per second. The network model will also change. The terminal-to-host model of the mainframe is already fading into the past, replaced by the client/server model. In the 1990s, according to Krause, networks will be served by "special-purpose" network computers with built-in circuitry for controlling the network and the Ethernet bus. These machines will act not only as file servers, but also as "compute servers," providing databases and communications control, as well as monitoring the network. If vendors develop "plug and play" networks, we could see an end to what Krause called "islands of LANs with no bridges."

Despite the eagerness of some industry observers and their broadcasters to bury OS/2, evidence at the Dataquest conference indicated that the obituaries are premature. The researchers

continued

If anyone
tries to tell
you that one
language
fits all, turn
the page.

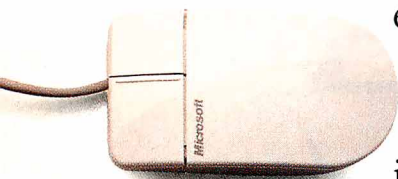
To each



Quick.

Despite what some software companies are saying, one language just can't be all things to all programmers. Which is why Microsoft offers a language for every level.

When you're starting out, you need learning tools that make it easier. Take our Quick languages, for instance. Each one features an integrated development environment that puts a powerful editor, compiler, debugger and on-line help within easy reach. And of course, all Quick languages are mouse-driven, so all commands are just a point and a click away.



More specifically, Microsoft® QuickBASIC comes with on-line support: QB Advisor serves as a state-of-the-art electronic manual, and QB Express can teach you how to use the environment in just minutes. Of course, you'll be more productive even faster with our new Easy Menus and the instant environment.

Or maybe you already know how to program and want to be introduced to the power of C.

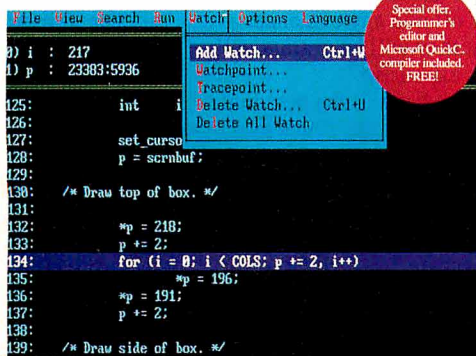
Microsoft QuickC® is your language. The fastest way to learn C: just use its integrated source-level debugger and advanced graphics capabilities. You'll be up and writing C programs in no time. Just like the name implies.

his own.

Microsoft C 5.1

Optimizing Compiler

For Personal Computers Running
the MS-DOS or MS-DOS[®]
Operating System



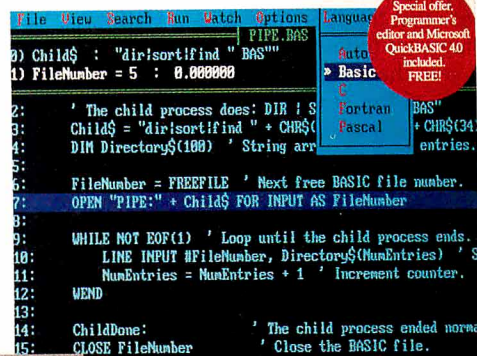
Now includes OS/2 systems support!

Microsoft

Microsoft BASIC 6.0

Compiler

For Personal Computers Running
the MS-DOS or MS-DOS[®]
Operating System



Now includes OS/2 systems support!

Microsoft

Professional.

Professional programmers are in a league all their own. So are the tools Microsoft provides the professional.

Each of our professional languages offers the complete development solution. Including the acclaimed CodeView.[®] An optimizing compiler for power. OS/2 support for access to the next generation of computing. And Microsoft Editor for the most sophisticated source code editing.

As for the most powerful BASIC ever to grace a PC, there's BASIC Compiler.

LOTUS	Lotus [®] 1-2-3 [®] Metro [™] Express
WORDPERFECT	WordPerfect [®]
ALDUS	PageMaker [®]
ORACLE	Professional Oracle [®] Oracle Server
MICRORIM	R:BASE [®]
PETER NORTON	Norton Commander Dan Bricklin's Demo Program
MERRILL LYNCH	DARWIN

Our languages speak for themselves—all of these industry hard hitters use Microsoft languages.

With its talent you have the ability to create smaller, faster executables.

Which isn't to say Microsoft C Optimizing Compiler doesn't have a few talents of its own. Lightning fast at running executables, it also features an incremental linker and support for various powerful platforms like MS-DOS[®] and Microsoft Windows, as well as Presentation Manager.

So no matter what level of computer programmer you are, Microsoft makes a language that lets you be the best you can possibly be. Which goes to show you, one language company really does fit all.

Microsoft[®]
Making it all make sense.

PageMaker is a registered trademark of Aldus Corporation. Lotus and 1-2-3 are registered trademarks and Metro is a trademark of Lotus Development Corporation. R:BASE is a registered trademark of Microrim, Inc. Oracle is a registered trademark of Oracle Corporation. WordPerfect is a registered trademark of WordPerfect Corporation.

NANOBYTES

"That's a long time in the PC business," he noted, saying that the history of consortium arrangements in the computer industry has not been very successful.

• Meanwhile, IBM Entry Systems president **Bill Lowe** told an audience at the Dataquest conference that the EISA bus only adds to the confusion in the industry. Because of the "limited clocking speeds" of the PC AT bus, upon which the EISA spec is built, an improved architecture is needed, and that improved architecture is the Micro Channel, Lowe said. He said that there are about 500 third-party applications available for the MCA.

Lowe defended IBM's recently announced PS/2 **Model 30-286** as a logical move to continue "pushing down price/performance." He said IBM will do the same thing to the Model 25 at some point. "When we can afford to do it, we'll put MCA on the whole product line," he said.

• The **Open Software Foundation** (Lawrence, MA), which continues to gain members, has listed the 26 companies whose technologies it will consider as "candidates" in its search for a graphical user interface for Unix. The OSF says it will develop within the next two years an **open version of Unix**; AT&T and Sun Microsystems are also working on a new Unix. Among the organizations asked to present their technologies are Adobe Systems, American Management Systems, Hewlett-Packard, Microsoft, Carnegie-Mellon University,

continued

said they polled 1500 software developers and found that about half of them are working on OS/2 applications; 25 percent are working on Macintosh or Unix applications. Sun Microsystems' Scott McNealy questioned why anybody would want to port to OS/2 when Unix is already a robust, working operating system that runs on multiple platforms. "Can you imagine OS/2 on anything but an Intel platform?" he asked. Perhaps what McNealy is overlooking is all those Intel-based machines out there. Fred Gibbons of Software Publishing said it's a matter of return and that most big software vendors see OS/2 as a much bigger opportunity than Unix. "I get a 1-to-1 return on my investment dollar, whether I invest in OS/2 or Unix," said Gibbons. "I'm going to invest on the biggest return. And that is clearly OS/2 and the Presentation Manager."

As McNealy has suggested in recent months, low-cost workstations based on

Sun's SPARC architecture will flood the market in the next few years, and we keep hearing that Sun's first SPARC PC will arrive early next year. Alan Hald, founder of the MicroAge chain, said low-cost graphics workstations will be common in retail outlets. Certainly the machines we have to choose from will be more advanced, but no one has offered any evidence that they will be dramatically less expensive.

So what will the personal computer of the 1990s look like? According to Gordon Campbell of Chips & Technologies, the typical microcomputer will have 2- to 4-megabyte 3½-inch floppy disk drives, 80- to 140-megabyte 3½-inch hard disk drives, and a 500- to 1000-megabyte optical disk drive. The machine will have a 32-bit CPU, 4 to 16 megabytes of RAM, a 1-megapixel display, SCSI and audio interfaces, and built-in local and remote communications channels. More software will be built into sili-

con in the form of programmable processors. According to Campbell and also to Zenith's John Frank, both the Micro Channel and EISA bus architectures will coexist in the next decade. No one in the computing mainstream is talking much about voice input, but if designers can come up with systems that can handle big vocabularies and varying pronunciations, people might soon be talking to their computers instead of tapping keys or moving mice.

One thing will not change: Users will still be the factor that determines what succeeds in the marketplace. Rival companies and consortia will continue banging it out, while users look for the system that solves their problems and helps them produce. Most will be bored by vendor politics, not caring if it's OS/2 or Unix, Open Look or OSF. As Tandy's John Roach told an audience of industry executives, "It's the users who drive this industry and not the people in this room."

The Voice: a Hand-Held Computer You Can Talk To

There was a great scene in the last Star Trek movie, when the Enterprise crew returns to modern-day Earth: Engineer Scott boldly approaches a Macintosh computer, picks up the mouse, and speaks into it, assuming that the Mac will respond to his voice commands. The scene was good for a laugh. But if The Voice computer from Advanced Products & Technologies (Redmond, WA) lives up to its developers' claims, that part of the future could soon be here.

The Voice "holds the promise of becoming the world's most friendly, portable, and powerful hand-held computer," claimed company CEO Steve Rondel. Due to roll out last month,

The Voice contains proprietary natural-language speech-input software. The Voice is able to understand any speech input, regardless of dialect, Rondel claimed; it doesn't need or use a keyboard for additional input. The product is set to sell for \$2000.

The device "is wider but not as long as two video-cassettes taped together," said marketing manager Greg Ness. It weighs about 3½ pounds and is equipped with a 16-line LCD display. It has "100,000 times the file access speed, 6 times the memory capacity (4 megabytes), and more processors (8 and 16 bits) than the IBM PC," Rondel said. The Voice has its own operating system, specially designed

software, and custom chips. Rondel said the proprietary operating system was developed because "computer operating systems today are too slow; speech recognition software is too archaic."

The Voice operates via a series of what Ness calls "application cartridges," which are roughly the size of a microfloppy disk. Each cartridge holds a different application in firmware. Initial application cartridges are for language translation. The Voice stores the speaker's speech pattern and is able to provide translation into another language, company officials said. The language translation depends on which cartridge is plugged in at the time.

continued

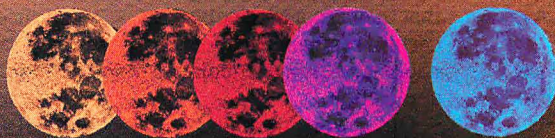
ONCE IN A BLUE MOON...COMES A STROKE OF GENIUS.

SCANMAN™. HANDHELD SCANNING FOR \$299.

Pop any image up to 4" x 11" straight into your PC. Clip it, crop it, color it. Resize and rotate it. Merge, save, and store it.

Choose between high contrast or high detail. Import images into any best selling publishing application—PageMaker™, Ventura™ and many more. All you need is \$299, an IBM PC, XT, AT or PS/2 (or compatible) with a spare slot, and five minutes to set up.

Choice of editing colors.



Scan directly into graphics editor for a full range of paint utilities.



Ideal 4" scanning window



**TO ORDER—or for the name of your nearest dealer—
CALL: 800-231-7717, IN CALIFORNIA CALL:
800-552-8885.**

Or fill in the coupon:

BY

Name _____

Address _____

City/State/Zip _____

Phone _____

Send to: LOGITECH, 6505 Kaiser Drive, Fremont, CA 94555

© 1988 Logitech. PageMaker and Ventura are trademarks of Aldus and Ventura Software, respectively.

ScanMan™
The Hand-Held Scanner.



LOGITECH

Personal Peripherals. Worldwide.

Circle 171 on Reader Service Card (DEALERS: 172)

NANOBYTES

DEC, Virtual Machine Corp., Neuron Data, Digital Research, Apollo, and Sony Supermicro Systems. Not to mention AT&T Bell Labs.

• Chip giant **Motorola** (Chandler, AZ) and **PCPI** (San Diego, CA), which makes laser printers and boards, say they'll work together to develop a line of chips that will mean **faster but cheaper** laser-printer controllers. The first pair of chips will boost laser printers built around Motorola's 680x0. Related announcements would arrive around Comdex Fall, they said in early autumn.

• Researchers in artificial intelligence, by de-

continued

"We're able to provide this kind of speed and recognition because we've broken the speech recognition problem into domains of application," said Ness. "Other voice recognition systems try to take on the whole English language; we've made our cartridges so that they recognize only certain segments of speech necessary for a particular application."

Other working applications for The Voice in-

clude voice-driven calculation with optional voice response, and an appointment calendar. "With a little name dropping, you can access the person's address, phone number, and tones to dial the telephone, all in less than a second," said Ness.

Advanced Products has shipped development systems to several software companies. Although Ness declined to identify any of the companies, he said, "Just think

of the biggest names in the software industry that have developed the most popular software packages, and you wouldn't be too far off the mark as to those already developing applications for The Voice."

When asked about potential compatibility problems, he said, "I can't comment on that now, but we'll have another announcement regarding that subject in 3 to 4 months. We don't think it's a problem."

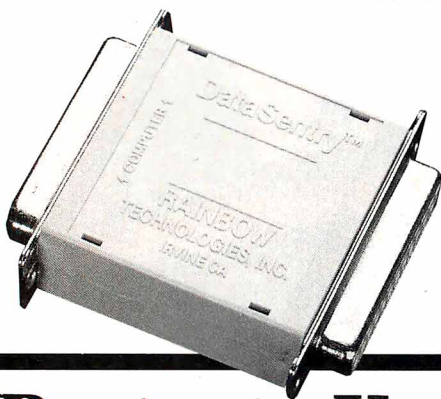
Object-Oriented Application Generator Uses Visual Programming

While object-oriented programming is bound to become more prevalent in the personal computer industry, typical object-oriented systems tend to be difficult for many people to

learn. But a new company called Maxem (Mesa, AZ) has a database application generator that promises to let both programmers and nonprogrammers take advantage of the benefits of ob-

ject-oriented programming. What's equally notable is that the new program, called Cause, runs on both the Macintosh and IBM families of systems. Cause

continued



Data Sentry™



Protects Your PS/2 and PC Data

The DataSentry from Rainbow Technologies offers a cost-effective means of protecting files on any IBM PS/2, PC/XT/AT, or compatible. The DataSentry is a compact, user-installable, external hardware security system utilizing DES methodology. It is the only protection system of its type that is fully compatible with all models of the IBM PS/2 system.

Applications

- IBM PC/XT/AT and compatibles
- IBM PS/2 — *all models*
- Laptop computers

Benefits

- Secured modem transmissions
- File privacy on shared computers
- Department-wide data security

Features

- Simple to use and completely user-installable
- Can protect individual files or whole directories
- Encrypts files using DES or a fast proprietary algorithm
- Compresses encrypted files to save disk space
- Provides master keys for multi-level security systems
- Optional password protection

The DataSentry System. The Key to Safe Files.

 **RAINBOW TECHNOLOGIES**

18011-A MITCHELL SOUTH IRVINE, CA 92714 USA
(714) 261-0228 TELEX: 386078 FAX: (714) 261-0260

© 1988 Rainbow Technologies, Inc. DataSentry is a trademark of Rainbow Technologies. IBM is a registered trademark of International Business Machines.

Concurrent DOS 386

Think small in a big way

When you think multiuser/multitasking, think Concurrent™ DOS 386, the big name in small systems from Digital Research®, architects of the first standard operating system for personal computers. Now, Concurrent DOS 386 allows multiple users to share peripherals, files and applications, using serial terminal workstations linked by RS-232 cables to the system. It's fast, reliable and economical.

The big news today is small systems

Concurrent DOS 386 meets the increasing demands placed on small systems by supporting multiple DOS programs on both the system console and attached terminals. You can run popular programs such as Lotus® 1-2-3®, dBase® III, WordPerfect® and many more, with full math coprocessor support. The system runs up to 255 tasks simultaneously, with full intertask communications and byte-level record, file and device locking.

For people who hate waiting in line

Concurrent DOS 386 brings you all the remarkable speed and power of the Intel® 80386 processor. A prioritized pre-emptive scheduler allows task execution

and intertask communication by several users at near full processor speed while letting some tasks "interrupt" others according to the needs of each user.

A small system with a big memory

Concurrent DOS 386 gives you access to four gigabytes of linear physical memory. Its powerful memory paging capability fully supports the Expanded Memory Specification with no additional hardware or software.

Menus at a touch

Now you can create and customize menus, while programmable function keys let you condense complex commands to a single keystroke. The file manager runs standard operating system functions, plus you have an on-line help facility, text editor and support for DOS-based device drivers.

Multiuser color graphics

Now with the introduction of the newest member of the Concurrent DOS family, Concurrent DOS 386/Multiuser Graphics Edition, your demands for high-resolution EGA bit-mapped graphics in the workstation environment can

be met. Take advantage of advanced technology allowing you to run popular DOS-based graphics programs on individual workstations as well as on the system console without sacrificing system performance. Ask us about this exciting new version of Concurrent DOS 386.

All you have to remember is Concurrent DOS 386

Concurrent DOS 386 from Digital Research is the name to remember when it comes to 386 technology. The power and versatility of Concurrent DOS 386 are giving a new meaning to the word multiuser.

**CALL DIGITAL RESEARCH AT
1-800-443-4200 AND ASK FOR OUR
CONCURRENT DOS PROGRAMMER
INFORMATION KIT.**

CONCURRENT DOS 386: SHARING THE SYSTEM AFFORDABLY

Digital Research and the Digital Research logo are registered trademarks, and Concurrent is a trademark of Digital Research Inc. Other product names are registered trademarks or trademarks of their respective owners. Specifications are subject to change without notice. Copyright © 1988, Digital Research Inc. All rights reserved.

 **DIGITAL RESEARCH®**

NANOBYTES

veloping successful expert systems, "have created an enabling technology for the creation of national wealth," AI pioneer Edward Feigenbaum told the American Association of Artificial Intelligence. Feigenbaum said use of expert systems is growing rapidly, and with it, gains in productivity. Today there's an estimated 2000 expert systems deployed in the U.S., Japan, and Europe, he said. "In the postindustrial society of the knowledge worker," said Feigenbaum, "a change of 0.1 percent in the nation's productivity will result in the creation of \$50 billion in the course of a decade."

may be very useful for both consultants and microcomputer managers who need to develop large numbers of reliable special-purpose applications.

Object-oriented programs are so named because they are divided into objects—small modules that contain both programming instructions and data. Since the modules or objects are completely separate from one another, object-oriented programs are easy to modify; you can change an object without any regard for

side effects in other parts of the program. However, it hasn't been easy for most people to get accustomed to the syntax used in object-oriented systems.

Cause gets around the syntax problem by using a visual programming interface. You select items from various menus of choices. The menu-based approach ensures that syntax is always correct.

When you finish designing your application, the system saves your choices as a program in a proprietary ob-

ject-oriented metalanguage. Maxem has already written several of these programs, which it calls Effects. You cannot modify this code directly, but you can do so using Cause's visual-programming interface. You can also execute the code using the system's interpreter, compile it into a stand-alone application, or transfer it either from the Mac to the IBM or vice versa.

Maxem claims that the underlying database engine is a rather standard engine precompiled in C, and it is thus as fast as any other database system.

Cause, scheduled to ship this month for both the Mac and the PC, will sell for about \$495. For \$100 more, you can obtain a renewable, 1-year license to market an unlimited number of application programs created with Cause.

TECHNOLOGY NEWS WANTED. *The news staff at BYTE is interested in hearing about new technological and scientific developments that might have an impact on microcomputers and the people who use them. If you know of advances or projects relevant to microcomputing, please contact the Microbytes staff at (603) 924-9281, send mail on BIX to Microbytes, or write to us at One Phoenix Mill Lane, Peterborough, NH 03458. An electronic version of Microbytes, which offers a wider variety of computer-related news on a daily basis, is available on BIX.*

Travel With A Fast Crowd.



Wherever your business takes you, take along the WorldPort 2400™ Portable Modem. Leaving the office doesn't have to mean leaving behind the world of high-speed, 2400 bps communications. Worldwide, in virtually every situation, including hotel rooms and phone booths, your ability to communicate clearly and efficiently remains intact.

Representing the cutting edge of modem technology, the WorldPort line of portable modems combine a broad range of features that bring you the best value in modems today. Features

that go far beyond costly internal units, such as Bell and CCITT standards, direct connect and acoustic interface (300 and 1200 bps), battery power, shirt pocket size, and a tiny price.

In fact, the WorldPort modems are the ultimate for both portable and desktop applications. And the WorldPort 2400 comes with Carbon Copy PLUS™ communications software, for even greater value.

If you want a modem that works where you do, put the WorldPort Series to work for you. In

the office. On the road. Or at home. For more information about our full line of WorldPort modems, or the name of your nearest dealer, call us at 800-541-0345. (In New York, 516-261-0423.)



Touchbase Systems, Inc.
160 Laurel Avenue
Northport, NY 11768
(516) 261-0423
TELEX: 6502848020
FAX: (516) 754-3491

WorldPort 2400 is a trademark of Touchbase Systems, Inc. Carbon Copy PLUS is a trademark of Meridian Technology, Inc.

RELIANT BACK-UP



Only Sysgen tape backup systems are so reliable we'll back up your data with dollars. Here's how:

Two Year Data Loss Recovery Contract.

Can you really trust your backup if a failure occurs?

Yes—if you're using Sysgen™ Reliant streaming tape backup for your PC/XT™/AT™ and PS/2™ systems. Only Reliant offers you *added assurance* against data loss. We'll guarantee you this: if you're unable to retrieve your data from a Reliant tape, we'll pay your data recovery costs up to \$1500 if you're under our Data Loss Recovery Contract* (2 years: \$50, 1 year: \$25). No other tape backup manufacturer offers you this extra protection.

Sysgen's rugged design and excellent price/performance will give you peace of mind—and to give you maximum flexibility, all Reliant backups are available in both external and internal versions.

But RELIABILITY is what backup—and Sysgen—are ultimately all about.

Series 300: Streaming backup on industry standard 1/4" cartridge.

Systems are available at 60 and 125 MB capacity levels. Menu-driven software includes Reliant's exclusive *Autoverify* feature. Comprehensive backup features for Novell®, IBM®, and 3COM® make Series 300 ideal for network use.

Series 200: Cost-effective streaming backup on digital cassette.

Series 200 offers 60 MB capacity in a small 6" x 8" footprint. Data is stored on a compact cassette—you'll never struggle with a pile of floppy disks again. You can pre-set your backup times for automatic operation, while fast 5 MB per minute performance assures your

data will be secure—at your convenience.

Series 500: Latest technology 72 MB streaming backup in a 3 1/2" drive.

Advanced features make Series 500 compact, fast and quiet. The external system has a small footprint and is truly portable. The internal system fits perfectly into the 3 1/2" drive slot of the PS/2. Series 500's unique servo-tracking head mechanism ensures reliable tape interchange between PC and PS/2 configurations.

Back up Your Data With Dollars. Call the Sysgen Hotline for the name of your nearest dealer: 1-800-821-2151.

SYSGEN
INCORPORATED
556 Gibraltar Drive, Milpitas, CA 95035

*All claims subject to the terms and conditions set forth in the Sysgen Data Loss Recovery Contract. Sysgen is a trademark of Sysgen, Inc. XT, AT, PS/2 are trademarks of IBM Corp. IBM, Novell and 3COM are registered trademarks.

**SECOND
BIN FREE!**

\$400 Value. With purchase of any RX7100 through 12/31/88

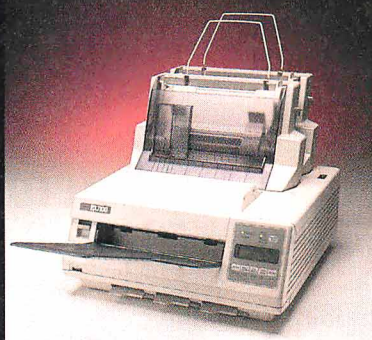
IBM®ers. HP® folk. Mac fanatics. How will you ever find one printer that pleases them all?

Easy.

With Fujitsu's new, very personal page printers, the RX7100 series.

To begin with, the economical Executive model gives you HP LaserJet™ Plus emulation, dual paper bins and a one-piece toner and drum cartridge for ease of replacement. Talk about paper handling—the RX7100 can automatically feed anything from envelopes to legal size paper from the same bin.

The Publisher offers Adobe® PostScript®, 35 resident fonts, expanded memory, HP LaserJet Series II® emulation with AppleTalk®, plus parallel and serial interfaces, to fill all your desktop publishing needs.



One last thing—a simple upgrade is all it takes to turn the Executive model into the Publisher. So you can start small and add more features later, when you need them. Want to know more? Call 1-800-626-4686.

Personally, you'll be doing yourself a favor.

Fujitsu RX7100. The Personal Page Printer.



FUJITSU AMERICA
Computer Products Group

"Personally, if I had to keep as many people happy as you do, I'd go with Fujitsu. You get laser quality, Adobe PostScript, upgradeability... and a price you wouldn't believe."



Circle 110 on Reader Service Card (DEALERS: 111)

OUTSTANDING SOFTWARE

\$2.49

Per Disk
(\$2.99 per disk
when ordering
less than 10)



Satisfaction Guaranteed or Money Back!

BUSINESS

- ☐ 13 - (2 disks) Prepare spreadsheets w/powerful Express Calc.
- ☐ 53 - Create, fill in & print yr business forms w/EZForms. 512K.
- ☐ 79 - Generate statements, ease record keeping w/the Invoicer.
- ☐ 117 - Handle your personal/biz money picture w/Finance Mgr II.
- ☐ 135 - (2 disks) Track inventory, sales, w/PC-Acct bookkpg mgr.
- ☐ 159 - (2 disks) Mass Appeal mail mgr for envelopes, labels, etc.
- ☐ 190 - Make accurate job, cost estimates w/PDS* Quote. 640K.
- ☐ 201 - Log bank transactions, produce financ'l reports w/Checks.
- ☐ 226 - (2 disks) File Express menu driven all purp database mgr.
- ☐ 232 - (2 disks) Friendly Dr. Data mail mgr is easy-to-use. 640K.
- ☐ 234 - Control & update inventory w/T-Master; know daily levels.
- ☐ 267 - Add special chars, line graphics to yr word processr w/Qt.
- ☐ 316 - Manage clients, sales prospects w/Track! 512K, hrd disk.
- ☐ 319 - (2 disks) Keep appointments, update agendas w/EzDesk.
- ☐ 337 - Analyze your credit charges, paymnts, interest w/Charge!
- ☐ 383 - Track yr portfolio, get weekly reports w/Mutual Fund Mgr.

EDUCATION

- ☐ 186 - It's painless learning DOS w/the interactive DOS Tutor.
- ☐ 191 - Learn music, US states w/PC-quizzer. Sign lang demo!
- ☐ 228 - Build dazzling typing speed practicing w/PC-Fastype. ★
- ☐ 297 - Graphic mathematical puzzle game makes learning fun!
- ☐ 366 - It's simple to keep, average student grades w/Gradescan!
- ☐ 376 - Teachers & students can summarize grades w/GradeM.
- ☐ 384 - (2 disks) XY-See graphic math for HS & college students.

GRAPHICS

- ☐ 58 - Display hi-res 3-D molecular structures w/Chemvw. EGA.
- ☐ 145 - (2 disks) Paint, draw w/Fingerpaint, design w/Altamira. ★
- ☐ 210 - (2 disks) Create advanced 3D designs! 640K, hrd disk. ★
- ☐ 285 - (3 disks) Produce grt 3-D images w/Surfmodl graphics. ★
- ☐ 362 - (2 disks) Edit graphics, colorize pics w/VGACad! VGA.

GAMES

- ☐ 15 - Biblemen game tests knowledge of Bible figures/events.
- ☐ 23 - Star Trek, Othello2 board game, artillery bombing. EGA.
- ☐ 28 - Play Backgammon, or Wordplay (like wheel of fortune)!
- ☐ 84 - Three solitaire card games, Spider, Klondike, Canfield! ★
- ☐ 121 - Qubert, Pango, Centipede, Hopper (lk Frogger), more! ★
- ☐ 151 - Hack puts you & trusty dog in a wild adventure (lk Rogue).
- ☐ 176 - Destroy enemies w/Striker, conquer the world in Risk. ★
- ☐ 215 - Solve, create own word puzzles with Phrase Craze!
- ☐ 289 - 3-D Pacman, Kong, Spacewar, ABM (missile cmd). ★
- ☐ 309 - Blackjack (you set rules), ArmchairQB, imperial war!
- ☐ 321 - Star Trek, the origin! Colossal Caves Adventure, more.
- ☐ 365 - (5 disks) Create your own grt adventure games. 384K.
- ☐ 372 - Pinball, Othello, Dragons, Sopwith (fly one), battleship. ★

UTILITIES

- ☐ 138 - Packed w/print utils for print spooling, banners, fonts, etc.
- ☐ 141 - Print wide docmnts/spreadsheets sideways w/On-Side!
- ☐ 214 - (2 disks) Search for addresses w/Zip-Phone cross ref.
- ☐ 258 - Work around DOS w/Easy Access hard disk menu sys.
- ☐ 275 - A collection of invaluable general purpose DOS utilities.

MISCELLANEOUS

- ☐ 31 - Movie Database lists 4,000+ films available on videotape.
 - ☐ 48 - (4 disks) Access 6000+ famous quotes from world history.
 - ☐ 74 - Trouble w/your landlord? Learn your legal tenant rights!
 - ☐ 85 - Add windows & give your Basic progs a professl look.
 - ☐ 146 - PC-Lotto helps you mathematically beat state lotto odds!
 - ☐ 153 - (2 disks) The popular word processing system; PC-Write.
 - ☐ 291 - (2 disks) Record your own or play music w/PianoMan!
 - ☐ 367 - Keep track of all your tapes, LPs, & CDs w/Music Library.
 - ☐ 386 - (2 disks) 150+ fantastic cooking recipes. Add your own!
- ★ Disks so marked above require a color graphics adapter.

Membership Special! \$19.95 (reg. \$34.95)

For \$19.95 (\$25.95/year for 3.5") become a MicroCom Systems member and get: "The Shareware Book" (\$12.95 separately), a subscription to "Shareware Review" magazine, 6 free new-release shareware disks (one featured each issue), low member prices, and any disks in this ad for only \$1.99 each! (\$2.99 for 3.5")

■ 3.5" disks desired (add \$1.00/disk to applicable price)

MicroCom Systems
3673 Enochs Street
Santa Clara, CA
95051

Cost of disks _____
Membership _____
Shipping \$3.00
CA res tax _____
Total encl. _____

Phone Toll Free for Same-Day Shipment!

(800) 727-5995
©1988, MCS Mon-Fri 7am-9pm, Sat-Sun 8am-5pm BY-12/88

LETTERS

Burks's Reply

My wife, Alice R. Burks, and I greatly appreciate G. Michael Vose's review of our book, *The First Electronic Computer: The Atanasoff Story* (September). Vose provides an unusually perceptive account of John V. Atanasoff's electronic computer, emphasizing the significance of his original algorithm for the design of the entire machine. He also gives an excellent summary of the Honeywell-Sperry Rand court case that proved both the primacy of Atanasoff's computer and its influence on the ENIAC, emphasizing here the significance of John W. Mauchly's own admissions on the witness stand.

My purpose now is to correct a misconception about my motivation in co-authoring this book, as expressed in Vose's statement that "[Burks] had no qualms about encouraging his later employer, Honeywell, to challenge his old comrade's patent claims," and that the attendant "strong economic motivation taints ever so slightly Burks's role in telling the story."

It is true that I was a consultant for Honeywell in its suit against Sperry Rand over the validity of the ENIAC patent, but I actually worked in this capacity for only 12 days (over a period of 6 months). Moreover, I also consulted for Sperry Rand, Bell Telephone Laboratories, and IBM, all with regard to legal actions involving the ENIAC patent. My income for these services was not great: a total of \$7000 from all four parties.

As to Vose's belief that I encouraged Honeywell to challenge the ENIAC patent claims, this is simply not true. Honeywell neither needed nor received any encouragement from me in its pursuit of this case. Indeed, only after its attorneys gave me copies of critical documents that it (and Control Data Corp.) had unearthed did I begin to see that some of Atanasoff's ideas had been incorporated in the ENIAC (and the EDVAC). For Honeywell—as for the other firms—I merely provided information about the ENIAC as one who had been intimately involved throughout its design, develop-

ment, and debugging stages.

Let me also make clear that I had held a high opinion of John Mauchly, for both creative ability and professional integrity, up until my exchanges with Honeywell and the ensuing court case, when I became convinced that electronic computing concepts I had understood to be Mauchly's were actually Atanasoff's. In an early meeting on the EDVAC, for example, in which arithmetic circuits to interact with J. Presper Eckert's mercury-delay-line memory were being explored, Mauchly suggested a binary serial adder, radically different from the parallel decimal counters of the ENIAC. Needless to say, at that point in history we were all impressed, and no one thought anything of it when Mauchly and Eckert took out patents on several serial binary adders. Only through the ENIAC patent case was it revealed that the basic electronic element of Atanasoff's computer was just such an adder; that Mauchly had examined it and found it to work exactly as intended; and, indeed, that Atanasoff had designed his adder for use in conjunction with his own separate capacitor memory. Thus, while the Honeywell-Sperry Rand patent trial was gratifying in that it finally established who invented what, for me it was disillusioning as well.

Arthur W. Burks
Professor Emeritus
Philosophy and Electrical Engineering
and Computer Science
University of Michigan
Ann Arbor, MI
continued

WE WANT TO HEAR FROM YOU. Please double-space your letter on one side of the page and include your name and address. We can print listings and tables along with a letter if they are short and legible. Address correspondence to Letters Editor, BYTE, One Phoenix Mill Lane, Peterborough, NH 03458.

Because of space limitations, we reserve the right to edit letters. Generally, it takes four months from the time we receive a letter until we publish it.

dBASE® Users—Attack the Mac with FoxBASE+/Mac

New Frontiers, No Fears.

FoxBASE+/Mac gives you the unprecedented ability to run your dBASE programs on the Macintosh immediately—without changing a single line of code! But there's much more. *With FoxBASE+/Mac you can create beautiful, robust applications that are truly Mac-like—using the familiar dBASE language!*

Speed and Power.

FoxBASE+/Mac gives you speed to burn—plus the power and performance you've come to expect from Fox. In fact, FoxBASE+/Mac is *by far* the fastest database system available on the Mac today—up to 200 times faster!

View Window.

The View Window is the master control panel for FoxBASE+/Mac's graphical, non-programming interface. Use it to open and close files, set up indexes, establish relations, access BROWSE, and even to modify database structures!

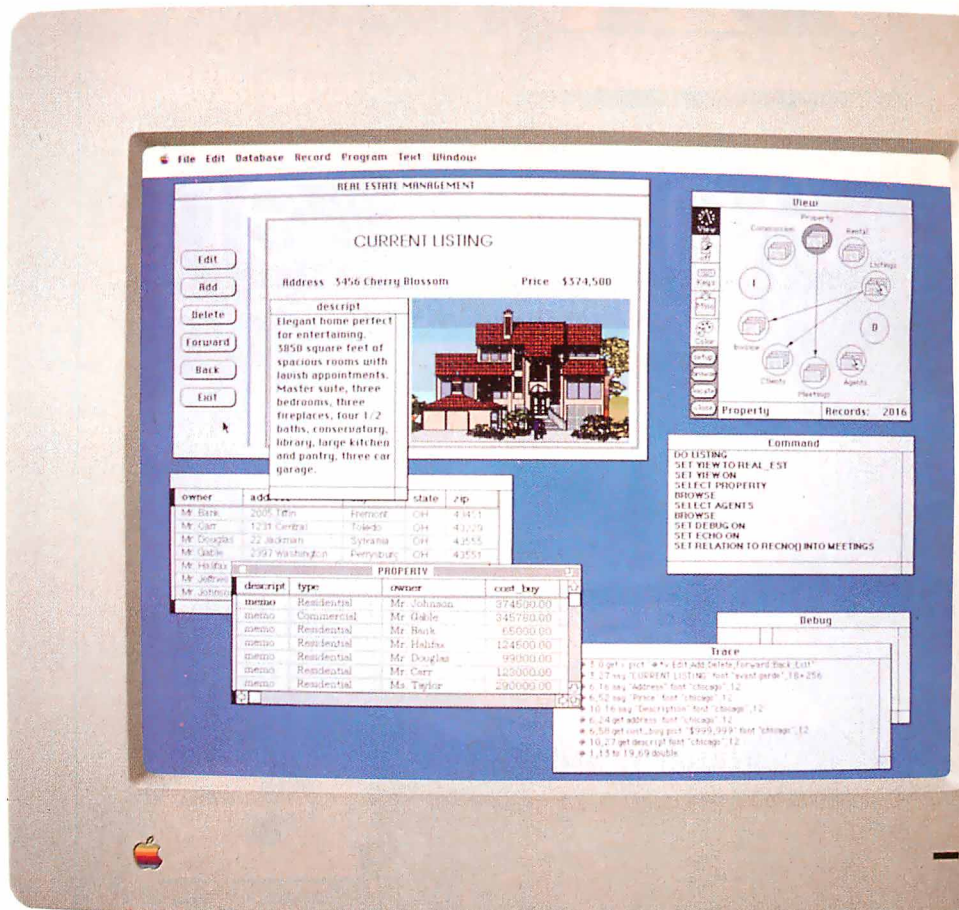
BROWSE.

FoxBASE+/Mac's BROWSE feature brings new convenience and power to database display and editing! You're in complete control—BROWSE lets you dynamically adjust the size and order of fields displayed, add or delete records, and split the window to show different database sections side-by-side. Together, BROWSE and View Windows *eliminate* the need to write programs for common database operations!

Integrated Graphics.

Copy and paste graphs, charts, diagrams and even pictures into your database—instantly! FoxBASE+/Mac gives you the power to display these graphics, or merge them into reports and documents!

FoxBASE and FoxBASE+ are trademarks of Fox Software. dBASE and dBASE III PLUS are trademarks of Ashton-Tate. Macintosh is a trademark of McIntosh Laboratory, Inc., licensed to Apple Computer, Inc.



You can create stunning screens like this with FoxBASE+/Mac—*immediately!* This actual FoxBASE+/Mac screen photo illustrates the View Window, Command Window, Integrated Graphics, Memo field editing, Trace and Debugging Facilities, and the BROWSE feature.

Command Window.

FoxBASE+/Mac's Command Window gives both experienced developers and novice user ultra-convenient access to the dBASE command language—just type a command into the Command Window, and it's executed!

Get The FoxBASE+/Mac Facts Now!

Call (419) 874-0162 Ext. 320 for more information about FoxBASE+/Mac. Or visit your local software retailer.

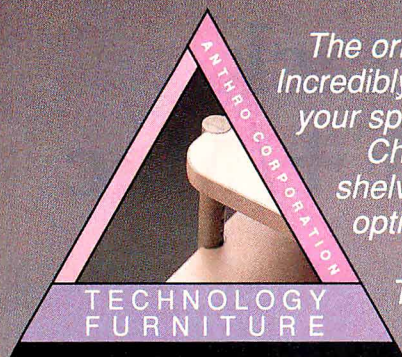


FoxBASE+/Mac is part of the award-winning family of products from Fox Software. For two years in a row, FoxBASE+ has been given the prestigious Editor's Choice award by *PC Magazine*, and scored an impressive 9.2 out of a possible 10 when tested by *InfoWorld's* Review Board!

Fox Software

Nothing Runs Like a Fox.

Fox Software, Inc. (419) 874-0162 Ext. 320
118 W. South Boundary FAX: (419) 874-8678
Perrysburg, OH 43551 Telex: 6503040827



The original AnthroCart. Mobile.
Incredibly strong. So many ways to solve
your space and equipment problems.
Choose different sizes. Move
shelves around. Add space saving
options.

AnthroCart. Well designed
Technology Furniture.

Look for our name.

AnthroCart®

Call us for more information: 800-325-3841



Made in U.S.A.
All steel frame construction
Easily holds up to 150 lbs.



AnthroCart and Technology Furniture are
registered trademarks of Anthro.

Anthro®
Technology Furniture®

3221 N.W. Yeon St.
Portland, OR 97210
503-241-7113
Telex: 940103

LETTERS

Where Blame Is Due

In the Nanobytes column (August), Apple Chief Del Yocam was quoted as saying, "The scarcity of 1-megabit chips is due to Japanese failure to foresee the growth in demand for 1-megabit chips and the Reagan administration's trade embargoes." This statement backs up the axiom, "The half-life of the facts is about 90 days."

The truth of the matter is that the Japanese are forced to limit their export of semiconductor memories to the U.S. by the protectionist measures put in place by the U.S. Congress. The Reagan administration opposed the measures. See you again in 90 days.

Al Cacace
Fort Lauderdale, FL

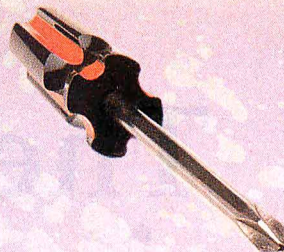
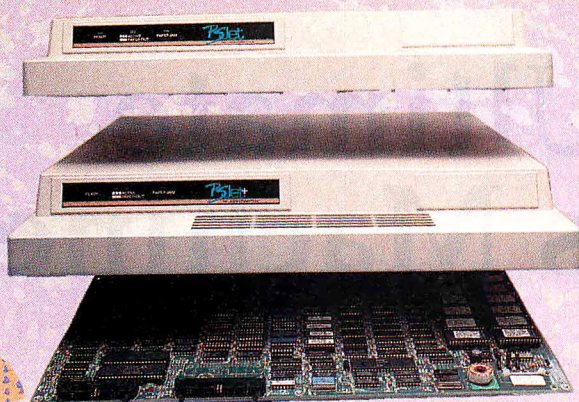
Image Compression

The advanced computer class of Rabat (Morocco) American School had been investigating fractal geometry when I read "A Better Way to Compress Images" by Michael F. Barnsley and Alan D. Sloan (January). In the interest of showing the class this impressive means of creating images with only a few bytes of information, I wrote a program in Applesoft BASIC using Barnsley and Sloan's random-iteration algorithm. I changed their "a, b, c, d, e, f" input to an input of rotation, scale factor, and translation for each affine transform. Adapting the iterated function system (IFS) image codes in the article's tables 1 to 4 into terms of rotation, scale factor, and translation was the beginning of our class solving the challenge of finding the two transformations that generate the spiral image in figure 13.

To develop an understanding of how and why a transform works, we investigated simple, single, and double transforms point by point. Then we made horizontal, vertical, and diagonal line segments using two or three transforms. Here, clues from the IFS tables helped. Progressively, we came to understand these and other transforms—what they do and why they work as they do.

At this point, we were prepared to tackle the challenge spiral. First, we made Archimedean spirals. Making measurements from figure 13, one can directly deduce the scale factor and rotation needed to make an Archimedean spiral with the same proportions as the figure's. But to restart the spiral inward, another transform is needed to relocate the point to the spiral's beginning (at point (1,1) in this case). This explains the translation of transform 1. Also, the

continued



Give your HP LaserJet the desktop publishing power you thought it had.



PS Jet+ & PS Jet+M PostScript upgrade kits

It can be frustrating to realize your HP LaserJet™ falls short of true desktop publishing capabilities. A PS Jet+™ or PS Jet+M upgrade kit from Laser Connection lets you correct that shortcoming. These upgrades incorporate the advanced print technology of QMS, Laser Connection's parent company, with 10 years' experience in developing print system technology.

Each upgrade kit adds the power of the Adobe PostScript® page-description language, the accepted standard for desktop publishing. They're the only such upgrades available for the HP LaserJet and other laser printers that use the Canon® CX® engine—Canon, NCR,™ QMS®, Talaris, CPT, and more.

Master a new language PostScript gives you the ability to exploit the full potential of desktop publishing. It takes you far beyond mere word processing to give you total control over the final appearance of your documents. Place text and graphics anywhere on the page. Design and redesign every detail to your liking. The end result is the high-quality output that you require.

In addition to PostScript, you'll get 35 resident typefaces with PS Jet+ and PS Jet+M. Should you want more, we throw in plenty of downloadable font space. Thanks to PostScript, there's an infinite number of font variations available. And every typeface can be printed in sizes from one point to as big as the page and beyond.

A transfer of power All it takes to replace your LaserJet's top cover assembly with the PS Jet+ or PS Jet+M is a screwdriver (included) and about an hour of your time. Each comes with HP LaserJet+,™ Diablo® 630 and HP-GL™ printer emulations for your non-PostScript software.

Simply put, PS Jet+ makes your HP LaserJet better *and* protects your initial investment. Call **1-800-523-2696** for the location of the Laser Connection dealer nearest you.

And be sure to ask for *The Sourcebook*™—our exclusive catalog filled with the latest laser printer products and enhancements.

**LASER
CONNECTION™**

A QMS® Company

The following are trademarks or registered trademarks of their respective companies: QMS, Laser Connection of QMS, Inc. Diablo of Xerox Corp. Canon, Canon CX of Canon USA, Inc. PostScript of Adobe Systems, Inc. HP-GL, LaserJet, LaserJet+ of Hewlett-Packard. NCR of NCR Corp.

Circle 286 on Reader Service Card

©1987 Laser Connection.

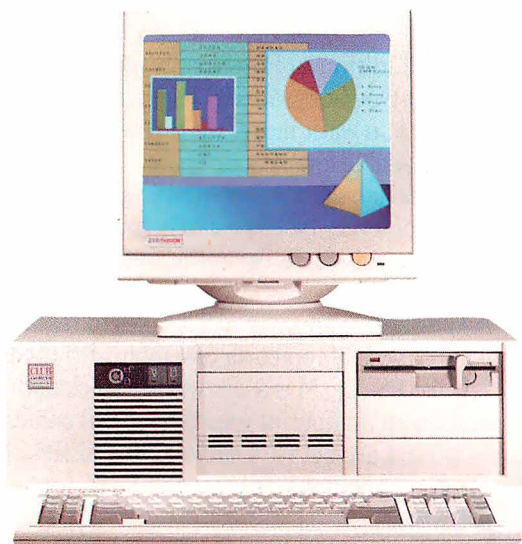
DECEMBER 1988 • BYTE 27

The Ultimate Business Machines

In just three years, CLUB American Technologies has grown into a multi-million dollar computer manufacturer. What's the secret to our success? The answer is simple, CLUB delivers solidly designed systems which are famous for high performance and superior quality. That's why so many fortune 500 companies depend on us. Additionally, CLUB's on-line engineers are available to support you every business day with optional on-site service available.

CLUB Model 200 Series

The Model 200 Series are **OS/2 compatible**, 80286 based systems. They are available in either 8 or 10 MHz versions to fit your specific needs. These economical, yet full featured AT compatibles are perfect for any applications such as spreadsheets and word processing.



Model 200 Series Features & Pricing

Intel 80286 CPU -208/208S-6/8MHz, 210/210S-8/10MHz, 211-8/10MHz '0' wait state, 512K DRAM, 1.2MB Floppy Disk Drive, 80287 Math Coprocessor Socket, HD/FL Controller (controller is built-on motherboard for 'S' Models) Keyboard Speed Switchability ('S' Models), 2 Serial/1Parallel Ports (211), 192 Watt Power Supply, 101 Key Enhanced Keyboard, Documentation and more.

200 Series

with Monitor and Adapter

Model with Hard Disk	Mono	EGA	VGA
208 or 208S with 20MB	\$1275	\$1625	\$1875
208 or 208S with 40MB	\$1420	\$1770	\$2020
210 or 210S with 20MB	\$1705	\$2065	\$2305
210 or 210S with 40MB	\$1850	\$2210	\$2450
211 with 20MB	\$1805	\$2165	\$2405
211 with 40MB	\$1950	\$2310	\$2550

CLUB Model 212 Series

With an **effective throughput of 16 MHz**, the Model 212 Series is as fast as many 386 machines at a fraction of the price. Compatibility with the existing AT standard ensures that the Model 212 will run your large databases, and complicated financial software today, as well as **OS/2** applications tomorrow.



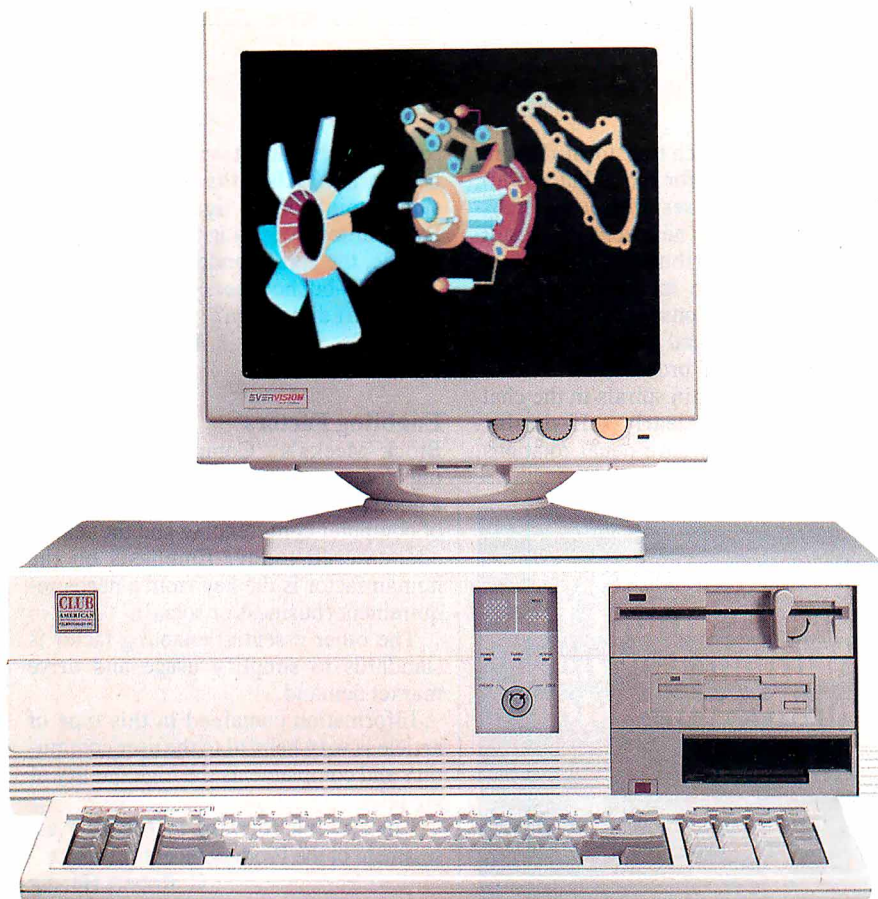
Model 212 Series Features & Pricing

Intel 80286-8/12, 1MB of DRAM, 1.2MB Floppy Disk Drive, 1:1 Interleave HD/FL Controller, 80287 Math Coprocessor Socket, Clock/Calendar/Configuration with Battery Backup, Reduced Chassis (212D), 192 Watt Power Supply, 101 Key Enhanced Keyboard, Complete Documentation, and more

212 Series

with Monitor and Adapter

Model with Hard Disk	Mono	EGA	VGA
212 with 40MB	\$2250	\$2615	\$2850
212 with 70MB	\$2505	\$2870	\$3105
212D with 40MB	\$2190	\$2550	\$2790
212D with 70MB	\$2445	\$2805	\$3045



CLUB Model 300 Series

The Model 300 Series 80386 microprocessor's state of the art design brings mainframe capability to the desktop at a vastly lower cost per seat. Complete compatibility with OS/2 and Unix give the Model 300 Series the ability to meet the most demanding multi-user and multi-tasking applications. Let CLUB give you the key to increased productivity in today's complex office and engineering environments.

Model 300 Series Features & Pricing

Intel 80386 CPU - 8/20 (320), 8/16 (316S), 1MB 32-bit DRAM (320), 1MB DRAM (316), 1.2 MB Disk Drive, 1:1 interleave HD/FL Controller (320), HD/FL Controller (316S), 80387 Math Coprocessor Socket (320), Weitek Support (320), 80287 Math Coprocessor Socket (316), 8 expansion slots, Clock/Calendar/Configuration w/battery backup, 192 Watt Power Supply, 101 Key Keyboard, Documentation, and more.

300 Series

with Monitor and Adapter

Model with Hard Disk	Mono	EGA	VGA
316S with 40MB	\$2690	\$3050	\$3420
316S with 130MB	\$4060	\$4420	\$4790
320 with 70MB	\$4005	\$4330	\$4675
320 with 130MB	\$5120	\$5445	\$5790

CLUB Model 110

The Model 110 is an affordable entry level computer. It's perfect for general business applications and for low cost network nodes.



Model 110 Features & Pricing

Intel 8088 CPU-4.77/10 MHz, 256K RAM Maximum 640K, Floppy Disk Drive and Controller, 8 Expansion Slots, 150 Watt Power Supply, 101 Key Keyboard, Documentation and more

100 Series

with Monitor and Adapter

System & Hard Disk	Mono	EGA	VGA
110 with 20MB	\$895	\$1255	\$1495
110 with 40MB	\$1080	\$1440	\$1680

Peripherals

For your convenience, we offer the latest peripherals to enhance your systems. Our manufacturing facilities are geared to build systems the way you want them. Call and tell us what you need. Here's a list of just some of the products we carry.

Storage.

Floppy Drives: 5.25" - 1.2MB	..... \$95
5.25" - 360K	..... \$85
3.5" - 1.44MB	..... \$120
3.5" - 720K	..... \$105
Tape Backups: Internal: 40MB	..... \$580
60MB	..... \$650
125MB	..... \$995
External: 40MB	..... \$620
60MB	..... \$690

Multifunction & Memory

(all prices with OK)

384K memory card for XT	..... \$99
576K memory card for XT	..... \$42
2MB multifunction card for AT	..... \$110
3MB extended memory card for AT	..... \$110
10MB EMS card for AT	..... \$150
2MB EMS card for AT	..... \$110
Mini I/O for XT and AT	..... \$75
Mini I/O w/ floppy controller for XT	..... \$85
80286 accelerator card for XT	..... \$299

Modems

1200/300 Baud rate internal	..... \$99
2400/1200/300 Baud rate internal	..... \$175
2400/1200/300 Baud rate external	..... \$210
1200/300 Baud pocket Mini Modem	..... \$139

* All modems come with Bitcom software

Printers

Star Micronix NX 1000 9 pin	..... \$199
Star Micronix NB-24-10 24 pin	..... \$493
Epson FX 1050	..... \$595
HP Laser Jet	..... \$1815

Products for PS/2

RAM 4000 (EMS) card OK	..... \$399
60MB Tape backup internal	..... \$1095
60MB Tape backup external	..... \$1285
120MB Tape backup external	..... \$1595
PS/2 modem 2400 baud internal	..... \$299

Others

80287-8	..... \$230
80287-10	..... \$279
80387	..... Call
Ram chips	..... Call
Logitech Mechanical mouse	..... \$79
Optical mouse	..... \$75
DOS 3.3	..... \$95

To Order:

Continental USA, Hawaii, Alaska:

Call (415) 490-2201

In Canada Call PC Centre,

Call (416) 470-0560

International

Call (415) 683-6623

Customer Support &
Technical Hotline

Call (415) 683-6580

Corporate, University and
Government P.O.'s Welcome

All prices are subject to change and quantities may be limited. We reserve the right to substitute equivalent items.

OS/2, MS DOS Unix, IBM PS/2, PC, XT, AT, Bitcom, Star Micronix NX-1000, NL24-10, Epson FX-1050, HP Laser Jet, Logitech Mechanical Mouse, Intel, VGA, EGA are the trademarks or registered trademarks of their respective companies

CLUB V v.1 8/23/88

CLUB
American Technologies, Inc.

3401 W. Warren Ave., Fremont CA 94539

smaller self-similar images have to be reduced to avoid overlapping. A scale-down of about $+ \frac{1}{4}$ works well. But at this point, it is apparent that the challenge figure's subspirals were flipped 180 degrees. Changing the sign of the scale factors to negative makes the flip. At this point, you only need to do some fine-tuning of the rotation to duplicate the challenge image of figure 13.

In their article, Barnsley and Sloan derived a relation for selecting the best

probabilities for each transform. This relation works well for most, but not all, cases. In some cases where one transform probability is near zero, the resulting random distribution of points is clearly inadequate for efficiently plotting the image. Consequently, in these cases adjustment and testing are needed to find the optimal probabilities.

The spirals within spirals in the challenge image are clearly self-similar. (Note that x and y have equal rotations,

scale factors, and translations for both transforms.) Also, the ideal one-dimensional points of the figure do not touch. By infinitely repeating the spirals within spirals, the figure undoubtedly becomes a fractal—but how does one determine its Hausdorff dimension?

Robert Dale Hall
Rabat, Morocco

Enabling Factors

Brock Meeks's "Computer Conferencing Homecoming" (September) provides a good perspective between the potential of computer conferencing and the reality encountered today. Emphasis on the human factor is the key from a needs requirement (business or social).

The other essential enabling factor is standards to simplify usage and drive market demand.

Information contained in this type of article is very helpful to the user community and complements the high quality of BYTE.

I'm looking forward to Meeks's assessment of the Prodigy videotex service.

C. Robert Hering
Doylestown, PA

Bus Advocacy

Recent articles in BYTE and elsewhere have pointed up the growing problem of the limitations that the IBM PC AT bus imposes on ever-more-nimble personal computers. Manufacturers have attacked the problem by building 80386 machines with dedicated, proprietary high-bandwidth memory paths in addition to the standard PC and PC AT buses. This helps memory access, but the incompatible 32-bit slots don't help the buyer, and they don't help the computer's access to high-speed disks, graphics adapters, and data acquisition peripherals.

Here are two possible clues to the answer: (1) Compaq and Dell have shown interest in the NuBus. This is the higher-performance, 32-bit bus that Texas Instruments has used in its Explorer AI workstation and Apple has used in its Mac II. (2) Microcomputers often follow the lead of their minicomputer cousins, and minicomputers have lately been hosting older buses on newer, higher-bandwidth buses to avoid making orphans of older products. This has been done by placing a bus adapter for the old bus into the backplane of the newer, more capable bus. The now-classic example of this is Digital Equipment Corp.'s VAX family of computers. IBM says to jump ship to its new Micro Channel, but we may well see the PC-compat-

continued

Cross-Byte™
3.5" Micro Drive Conversion

Add Advanced Storage Capacity to Your PC Without Buying a Totally New System



Regardless of the operating system you're running on your PC, you can quickly, easily and economically make your system compatible with today's advanced 3.5-inch micro-floppy drives.

The Sumitronics Cross-Byte is a complete micro drive conversion system that you can install and use... immediately.

In minutes, you can have up to 1.44 MB micro-floppy capacity in your desktop system without discarding the investment you've made in your 5.25-inch programs.

If you use a laptop computer on the road, you can plug the microfloppy diskette into your desktop system at home or at the office and complete your work. You can also add the convenience and expanded storage capacity to a PC, XT*, AT* or compatible.

To add advanced read/write compatibility to your desktop system, find out

why we supply the world's leading personal computer manufacturers with 3.5, 5.25 and 8-inch drives. Contact your local dealer today.



Sumitronics

Sumitronics, Inc.
A Subsidiary of Sumitomo Corporation
580 North Pastoria Avenue
Sunnyvale, California 94086

(408) 737-7683
FAX: (408) 737-9189



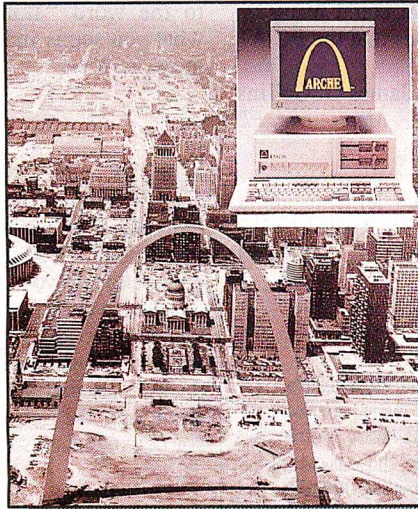
Y-E Data. Drives for Consistent Performance.

Cross-Byte is a trademark of Sumitronics, Inc.
XT and AT are registered trademarks of International Business Machines, Inc.
© Copyright Sumitronics, Inc. 1988



Built to Last

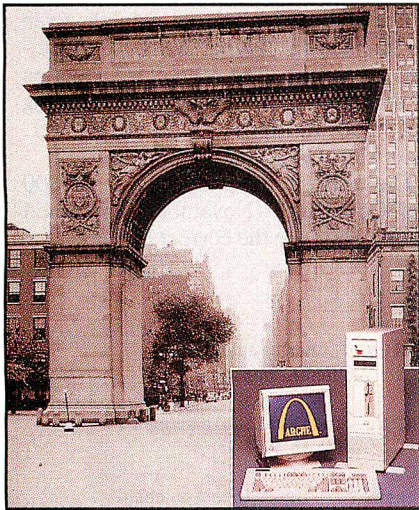
Two Year
Fixed Disk Drive Warranty



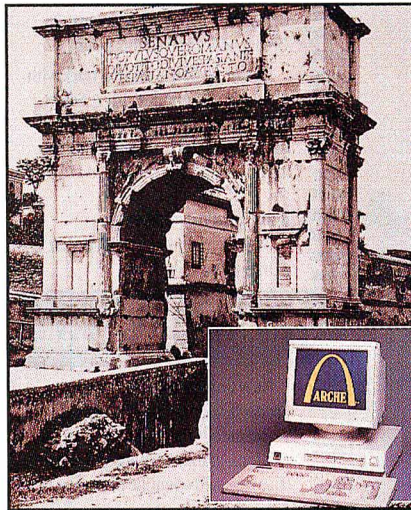
Arche Rival 286™ Personal Computer
The St. Louis Arch



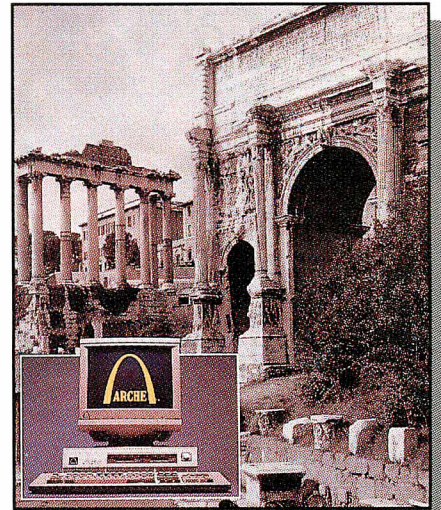
Arche Rival 386™ Personal Computer
The Arc de Triomphe de L'Étoile



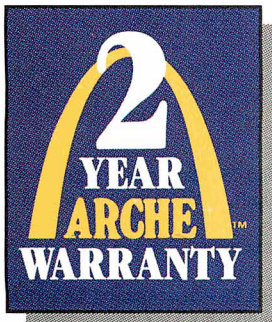
Arche Pro-File 286™ and 386™ Servers
The Washington Arch



Arche Station 88™ Personal Computer
The Arch of Titus



Arche Super Station 286™ Personal Computer
The Arch of Septimius Severus



QUALITY ABOVE ALL™

While others in the computer industry seem preoccupied with offering cheap technology, Arche Technologies offers something different: Quality Technology.

That's why every Arche product is designed by some of the best engineers in the business, and why each unit is hand assembled in the United States, passing through a rigorous series of tests and inspections.



1-800-422-4674
Arche Technologies, Inc., Corporate Headquarters and Manufacturing, 48881 Kato Road, Fremont, CA 94539

Arche, Arche Logo, Rival 286, Rival 386, Pro-File 286 Server, Pro-File 386 Server, Station 88, Super Station 286, and Quality Above All are trademarks of Arche Technologies, Inc.
©Arche Technologies, Inc., 1988. The Bettmann Archive, Inc.

ible market move gracefully toward NuBus, either with a few built-in PC AT-compatible slots for existing peripherals or with a minicomputer-style, optional bus adapter and PC AT-compatible card cage.

Where would this leave users? Probably better off. First, we wouldn't lose our investment in expansion cards. Second, we could grow into a new, more powerful architecture as our needs demanded without sacrificing industry-

standard memory slots. Third, having expansion options in common with the growing Mac II market could bring on the sort of bargain prices that the PC AT bus market now enjoys.

Dr. James G. Collins
Melbourne, FL

Printer Woes

Regarding Don Crabb's laments about Apple ("What's Up with Apple?," August): The software problems associated

with the Imagewriter LQ, which took me 4 months to sort out, give a new meaning to the word "stonewall." Apparently what you see is indeed what you get; no more, no less.

Spencer Merz
Waltham, MA

MacTip

Your special section on the Macintosh (August) is great. I have one piece of information that just might be handy to pass on to everyone.

When you have a situation in which you have to click and type, then click somewhere else and type, and so on, try the Tab key instead of the mouse. In most situations, the Tab key will move the cursor between fields for you.

Mark Favor
Bowie, TX

FIXES

- The address and phone number given for Xanadu in "Hyper Activity" (October) are wrong. The correct information is as follows: The Xanadu Operating Co., 550 California Ave., Suite 101, Palo Alto, CA 94306, (415) 856-4112.
- The listings we published in "T800 and Counting" (November) contained errors. Here are the correct listings:

(a)

```
CHAN OF INT chan1, chan2:
    -channel declarations
PAR
    INT A : - local variable scope is
        - first SEQ
    SEQ
        chan2 ? A - input into A on chan2
        chan1 ! 6 - output 6 on chan1
    INT B : - local variable scope is
        - the second SEQ (not shared)
    SEQ
        chan1 ? B - input on chan1 into B
        chan2 ! 9 - output a 9 on chan2
:
```

(b)

```
PLACED PAR
PROCESSOR 0 T8 - processor 0 is a T800
    PLACE chan0.out AT link0.out : - put
        -chan0 at hard link0.out
    navier.stokes() - solve the Navier-
        -Stokes equations
PROCESSOR 1 T8 - processor 1 is a T800
    PLACE chan0.in AT link0.in : - put
        -chan1.in at hard link0.in
    graphics.output() - dump the output (in
        -real time)
:
```



PC-Write 3.0 — Working on a whole new scale.



Power. Speed. Performance.

We listened to you and added hundreds of features to PC-Write.

Larger Files — Break the 60K file limit! Use all available DOS memory to edit large documents. Rapidly search and switch between related files. Lock files on a network.

More Formats — Edit multiple columns on-screen. Or mark text as a box, then position and format it. Create tables and scripts faster.

Easier To Use — Stay on track with on-screen "reminder" lines. Select page layout and fonts with new menus. Fix typing mistakes with our improved spelling checker.

New catalog adds value.

We offer popular products that work well with PC-Write.

New Capabilities — Choose products such as InSet™ graphics, WordFinder™ thesaurus, or popular soft font, grammar checker, foreign language, and scientific packages.

Special Discounts — Registered PC-Write users get phone support and reduced prices for all products.

Still only \$89.

The \$89 registration fee gives you software, user's guide with tutorial, phone support, two free updates, and our newsletter. PC-Write 3.0 is still shareware, so you can give copies to others to try, free!

Order PC-Write 3.0 today.

Call 1-800-888-8088 BYTZ

90-day money-back guarantee

PC-Write is not shareware outside the U.S. and Canada. PC-Write™ Quicksoft, WordFinder™ Microlytics, InSet™ InSet Systems, Quicksoft, Inc., 219 First Ave N #224-BYTZ, Seattle, WA 98109. 206-282-0452.



Quicksoft

The future of
personal computing
now rests
on just one thing.

MAKING IT ALL

MAKE SENSE

At Microsoft, first we make it possible.

If you happened to catch the January 1975 issue of *Popular Electronics*, you were one of the lucky few to witness the debut of the personal computer.

Impossible as it seems, a magazine with less than one-tenth the readership of *Time* or *Newsweek* launched a technology race roughly parallel to that of the space program.

It also launched a company that immediately assumed center stage in the exciting new world of personal computing. The company was Microsoft, and the tenet upon which it was founded was a simple one. To see a computer on every desk and in every home.

To take that rudimentary new

contraption that was the early personal computer and turn it into the powerful machine that has literally changed the way we work, required some important

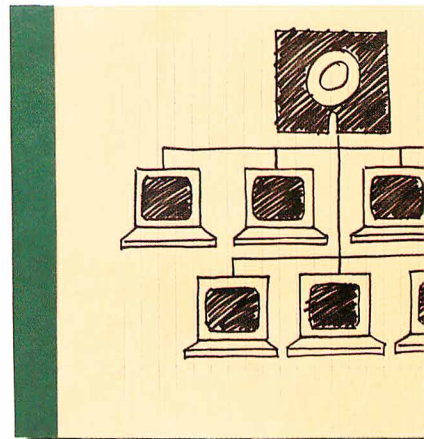
steps. The first order of business was to create not simply products, but standards. Microsoft® BASIC became the first universal programming language for the personal computer. And set a standard upon which an industry could grow.

Next came what

is now the world standard PC operating system, MS-DOS®, developed by us and chosen by IBM for its first personal computers. Today, 20 million machines run on it, and so does a billion-dollar software industry.

And when the Macintosh® was

being developed, we were there. That early participation allowed us to write its richest and most important software. These crucial pieces include the powerful



Networking made practical, with software d

Microsoft Word, the much-applauded Microsoft Excel, and Microsoft Works, the single-solution program for the diverse needs of small business.

As we were contributing to the development of the Mac®, we were also developing a system to put graphics interface technology into the world of IBM® PCs and compatibles.

The introduction of Microsoft Windows in 1985 meant that an easy-to-understand desktop graphical environment now appeared on PCs. Ultimately, this friendly screen will forever replace the cold theater of character-based computing.

But Windows is more than just a useful tool. It is an important technological feat, one that becomes critical to bringing into



The world wasn't waiting. We were. The PC makes its debut.



MS-DOS with Windows. Mac. MS OS/2. Three ways to go. One driver. Microsoft.

Then w it prac

The philosophy behind Micro-
soft includes another, equally

important, notion. That all the tech-
nology in the world doesn't
add up to a hill of beans
unless it is practical,
useful and, above all,
easy.

*Easy commands from
pull-down menus make
window-shopping easy.*

Unless it makes sense.
That's why, whether you're
using a Microsoft application
on a Mac, an MS-DOS or even
an OS/2 machine, it will have a
comforting familiarity. Because
today's computers share a
common software guardian.
Microsoft.

Thanks to our ground-
breaking work on the graph-
ical interface for the IBM
PC and its compati-
bles, virtually every
personal computer
can give its user a
simpler way to
get a lot more
done. With a
screen that
thinks in pic-
tures instead of words, arranged
like papers on a desk. Naturally,



We make it practical.

working with pictures makes the work you turn out much more interesting. Which is why the introduction of Microsoft Windows to the IBM PC and compatibles brought with it a whole new category of software with impressive credentials. Like

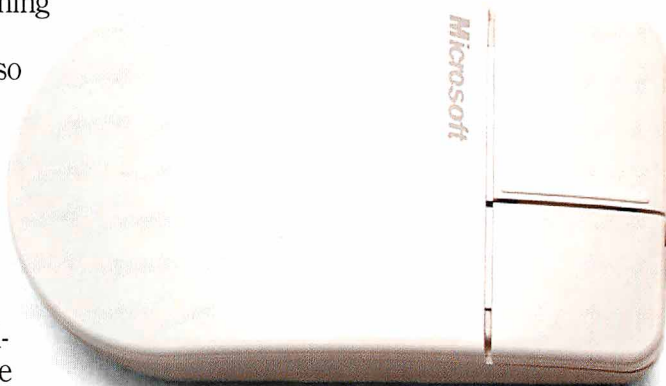
a more finished look. And no matter what application you're using, Windows will take over the job of running your printer.

There is also a hardware complement to graphical applications: the Microsoft Mouse. An unprecedented 1.5 million users have found that a simple point and click eliminates complicated keyboard commands.

Our Windows spreadsheet

macros from other programs.

The new generation of PCs will run OS/2 with Presentation



A simple point and click replaces mumbo-jumbo keyboard commands.

Manager, taking our graphical screen to even greater heights. By unlocking the capability of these machines, users can easily switch between programs almost instantly. Members of a workgroup can work together on an unlimited number of tasks.

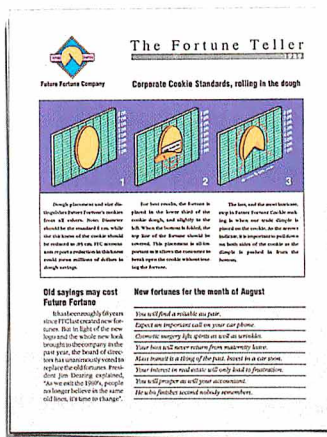
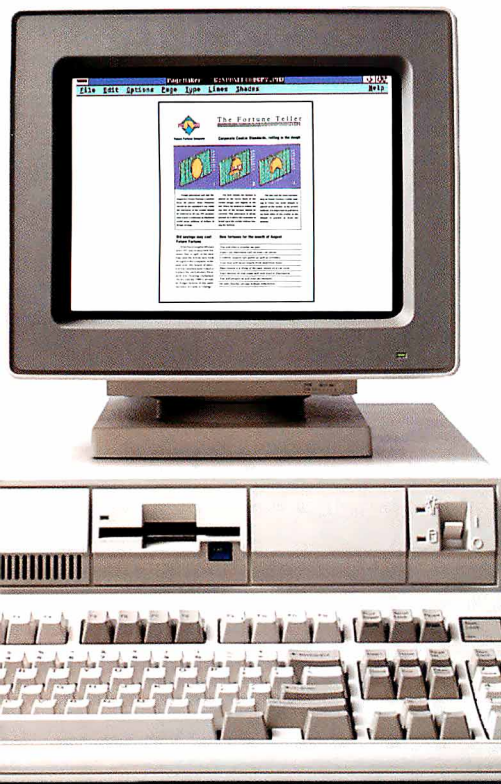
And finally, every kind of program, from spreadsheets to electronic mail to word processing, works in a common way. To the user, learning one is a quick step toward learning them all. To the corporate bottom line, it means far less valuable time and money are spent on training.

But the real practicality of the graphical user interface comes to life when, inevitably, it appears on every computer screen, everywhere. And networking becomes not only possible, but required in this competitive world.

When you think about it, the goal Microsoft set in 1975 of seeing a computer on every desk and in every home seems close at hand. Because, at Microsoft, our fierce pursuit of technology comes with a promise to keep.

Making it all make sense.

Microsoft®
Making it all make sense.™



*WYSIWYG, as in What You See
Is What You Get.
No translation needed.*

program, Microsoft Excel, goes so far beyond just simple number-crunching that it has received

unparalleled acceptance in corporate America. More powerful than any other, it also easily delivers sophisticated charts, graphs, text and data pulled simultaneously from several sources. And to make it even easier, we built it to graciously accept files and

desktop publishing. And presentation applications that let you create a sophisticated graphics show, from your office instead of the art studio's.

With Windows giving laser printers their marching orders, all manner of documents take on



Microsoft[®]
Making it all make sense.

*For the first in a series of articles detailing Bill Gates' perspectives on personal computing into the 1990s, call Microsoft at (800) 323-3577.
In Canada call (416) 673-9811, outside North America, (206) 882-8661.*

CHAOS MANOR MAIL

*Jerry Pournelle answers questions about his column
and related computer topics*

Keeping a Perspective on Viruses

Dear Jerry,

As a great admirer of your and Mr. Nivens's work, it saddens me to read of your exaggerated fear of viruses. I have been a sysop for several years on several different types of systems, ranging from an IBM PC AT to even 8-bit (a less reputable computer type cannot be found) computer systems. My current system is an XT-class AT&T PC6300 with 60 megabytes of drive space.

As a sysop of a larger-scale system, I have many files going in and out of my system, both from users and from the international FidoNet mail network. A virus cannot be transmitted through a dongle (a hardware security device) while it is attached to a parallel port; it's unlikely that a virus can enter any kind of data that would affect the system memory or disk drive(s). Virus transmission can be done with expansion cards, but not with copy-protection dongles.

As a rule, public domain (shareware, what have you) programs are usually well tested and devoid of harmful infectious programs. If we get an upload from someone we don't know, and we don't recognize it, we don't run it to begin with. If the program is then downloaded to another system of a user, and it proves to be harmful, it is then removed.

At one point, my system was infected by a virus that allocated itself as bad sectors and was well beyond my reach to fix without reformatting my drive. I knew that it came from one of my users, but I didn't know who or what program it was. We can at times have hundreds of archived files to sort through, and if we get hit, there's nothing you can do but delete files and start over. The virus's sole purpose, by the way, was to fragment my hard disk drive, one sector at a time.

Viruses can come from any source, truly enough. About your only clues are if a package comes from an unknown software house or user, contains no instruction files (e.g., *.DOC or *.TXT.), is distributed under public domain precepts, or is simply unsavory looking. Beyond that, and aside from a detailed de-

bug or analysis of the program, you cannot tell if you're in for trouble or not. Oddly enough, if a program is pirated, it is more often than not quite safe. Many piracy groups mean to do nothing more than distribute the "broken" software. In general, if the source is older than 21 and/or is a relative or friend, you should be safe with duplicates.

If a program is in any way suspicious, simply don't run it, or wipe it out. Also, programs from retail sources are usually reliable... most of the time.

Lastly, beware of software that is packaged as public domain, shareware, and so on, that is actually a pirated version of a reputable package. One example is a package called FIGHTER.ARC, which was actually a cracked version of subLOGIC's Jet. All evidence of the original company was wiped out and replaced with notices of the program's "public domain" origin. I got this package from an upload from a user. I was lucky in that FIGHTER was harmless, but I've seen what not-so-harmless ones have done to other sysops.

Michael Kitchin
Potomac, MD

Well, I wouldn't call it an exaggerated fear of viruses; I go whole days without thinking about them. Perhaps I did overdramatize, particularly in the case of the dongles. I really consider dongles an unlikely source of virus infection. But I don't think it's impossible.

As for my protection system, I won't run software of unknown origins on my primary system; and all my software is backed up on a WORM drive, so that if somehow I do get an infection, a disk reformat followed by a restoration from the WORM cures all.—Jerry

continued

Jerry Pournelle holds a doctorate in psychology and is a science fiction writer who also earns a comfortable living writing about computers present and future. He can be reached c/o BYTE, One Phoenix Mill Lane, Peterborough, NH 03458, or on BIX as "jerrypp."

Circle 36 on Reader Service Card
**Four ways to build
better C programs...**

NEW! POWER SCREEN \$129

Screen I/O manager.

Features: ♦ screen painter ♦ virtual screens
♦ data validation ♦ context sensitive help
♦ unlimited screens ♦ definable keys
♦ & much more!

C TOOLS PLUS \$129

Full featured function library.

♦ For Microsoft C 5.0 and QuickC.

Features: ♦ TSR support ♦ direct video access
♦ VGA and EGA support ♦ windows and
menus ♦ DOS memory allocation ♦ interrupt
service routines ♦ & much more!

C ASYNCH MANAGER \$175

Asynchronous communication manager.

Features: ♦ speeds to 19.2K baud

♦ XON/XOFF protocol ♦ hardware
handshaking ♦ XModem file transfer ♦ I/O
buffers up to 64K ♦ & much more!

TURBO C TOOLS \$129

Full featured function library.

For Borland's Turbo C.

Features: ♦ TSR support ♦ direct video
access ♦ VGA and EGA support ♦ windows
and menus ♦ DOS memory allocation
♦ interrupt service routines ♦ & much more!

We're Blaise Computing, manufacturers of high quality function libraries designed to reduce the time and technical expertise required for serious applications development.

All of our packages include a comprehensive user reference manual with extensive examples, and sample programs. Satisfaction guaranteed or return within 30 days for a full refund.

We have a full line of products for C and Pascal. For a free brochure or to order call

800-333-8087!



BLAISE COMPUTING INC.

2560 Ninth Street, Suite 316 Berkeley, CA 94710 (415) 540-5441

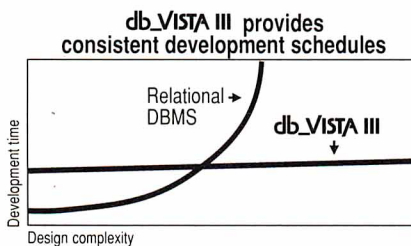
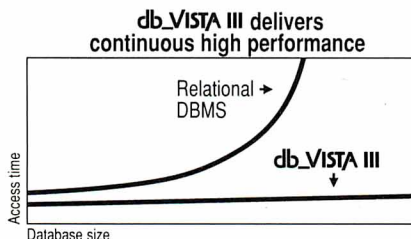
DECEMBER 1988 • B Y T E 33

Choosing the Right Database Development System Just Got Easier.

db_VISTA III™ Delivers High Performance With No Hidden Costs.

For database applications development, you want a system with performance, portability, and full functionality at a competitive price. But there's more to it than that. The long term costs associated with extended development schedules, frequent maintenance, excessive royalties, or the inability to handle complex data relationships are often overlooked. These hidden costs can be quite a shock after you have made a commitment and are midway through application development, or worse yet, in production.

With db_VISTA III from Raima, there are no surprises. It provides powerful database capability with tremendous overall cost savings. The heart of the system is db_VISTA, a high performance DBMS that uses B-tree indexing and the network database model file structure to minimize overhead and provide fast data access. Our SQL-based db_QUERY provides a relational view of the network structure, without sacrificing performance. And db_REVERSE lets you easily redesign your database. The entire db_VISTA III system is fault tolerant and complete source code is available.



db_VISTA: High Performance DBMS

Multi-user
Fast data access: B-tree indexing, network database model, virtual memory disk caching
Multiple Database Access
Referential integrity
Automatic recovery
Record and file locking
Database consistency check
Easy-to-use interactive access programs
Data Definition Language patterned after C
db_QUERY: SQL-based Query
Relational interface to db_VISTA databases
Yields extraordinary performance
Build ad hoc queries & reports
db_REVERSE: Database Restructure Program
Redesign your database
Converts existing data to revised design
Upgrade remote end user locations easily
Add WKS Library for Lotus 1-2-3
Fast C interface to Lotus, dBASE and others
Operating Systems: VMS, ULTRIX, UNIX
System V, BSD 4.2, SunOS, QNX, XENIX, OS/2, MSDOS, Macintosh, MS Windows
C Compilers: VAX, UNIX, XENIX, SunOS, Microsoft, Lattice, TurboC, LightspeedC, MPW
LANs: NFS, 3Com, NetWare, LifeNet, Banyan, and any other MS-DOS NetBIOS-compatible LAN. AppleShare and network-independent versions also.

Thousands of C programmers in over 50 countries worldwide have chosen Raima's db_VISTA III. Here are the reasons why:

- Fast data access
- Minimal data redundancy
- C source code available
- Automatic recovery
- Multi-user support
- Portable to VMS, UNIX, OS/2, MS-DOS and Macintosh
- SQL-based relational query
- No royalties
- Professional services
- Superior support

Maybe it's time that you checked out db_VISTA III. Consider *all* the costs. It could be the easiest choice you ever made.

CALL:

1-800-db-RAIMA
(that's 1-800-327-2462)

Ask about the many other products and services Raima Corporation offers, including consulting, application development, and training.

RAIMA™
CORPORATION

verting four lines of code, but not for anything more.

Second, I agree with Bruce Tonkin's approach. In fact, that is the recommended style for interpretive BASIC. An understanding of the behavioral characteristics of interpreters and compilers will make this clear.

An interpreter is a program that takes in each line of source code, converts it to machine code for the computer to understand, and executes it immediately. This

process is repeated for each and every line of source code it encounters, irrespective of how many times the line of code is encountered. This line-by-line interpretation results in slow program execution, since the computer spends more of its time interpreting rather than computing. One of the techniques of improving program performance is to use GOTOs wherever possible, instead of GOSUB-like commands when calling a module, since the latter require that the

calling address be pushed into a stack and popped back after the execution of the module: GOTOs do not.

A compiler, on the other hand, takes in the source program file, translates it into machine code once only, and creates an output object file that after linking is ready to execute. Program execution is fast, since the source code is translated only once, and the resultant module can be executed by the operating system as often as required without retranslation. Hence, GOSUB-like commands are preferable to GOTOs from the point of view of modularity and program readability.

Third, I don't agree with either you or Edsger Dijkstra that GOTOs are harmful. Careless use of GOTOs, yes; controlled use, no. In fact, for certain real-time applications in which procedure or subroutine call overheads are undesirable, or even when you're trying to escape the structured constructs due to a particular condition, GOTOs can be invaluable.

There are certain taboos about GOTOs, though. The main one is never to use a GOTO to pass control from one module or procedure into the middle of another. That will constitute what is known as "pathological connection" and can indeed be harmful.

GOTOs can be likened to very sharp knives. To say, "very sharp knives are dangerous, so don't use them" is the wrong admonition. The proper advice should be, "very sharp knives are dangerous, so use them with care."

Dogmatic use of the structured constructs can be harmful. And structured programming does not mean GOTOless programming. Indeed, the key to successful computing is flexibility.

Mobilaji E. Osunsanya
Lagos, Nigeria

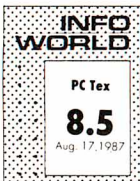
Your letter brings back memories of the early days of my column, when GOTO was often—and vehemently—debated.

My own view is that GOTO statements sometimes make things a lot easier, but the problem is not the GOTO; it's the label to which the GOTO refers: When you're trying to analyze code and you can't figure out how the program goes to that label, you can go mildly nuts; then when you discover there are three different ways it can get there, it gets worse. Thus, when someone sends me a program, I really would prefer that it didn't have GOTO statements.

On the other hand, I'm not above using them once in a while myself when I'm in a hurry and no one's looking. —Jerry ■

IF DESKTOP PUBLISHING WERE A BUICK, PCT_EX WOULD BE A LAMBORGHINI.

You'd expect us to say PC T_EX is hot—so don't take our word for it. In their desktop publishing systems category, INFO_{WORLD} rated PC T_EX #1. They said:



"...No non-T_EX-based program has such typological aesthetics...enormously flexible and offers complete control over the output of your printer..."

And from PC MAGAZINE: "...PC T_EX offers ample rewards. You can achieve incredible precision in formatting text, especially mathematical expressions."

TRY THIS!

with a standard desktop system and you'll see that for complex scientific and mathematical formulation and notation, PC T_EX leaves the others back in the dust.

FORMATTING with textbook quality and unsurpassed placement of

TYPE that rivals professional typesetting: all yours. Pick the type you like from 30+ Bitstream font families.

FLEXIBILITY Camera-ready, publisher-ready manuscripts are fast and easy. Author to printed piece time reduces, author control increases.

That's flexibility—that's PC T_EX.

$$\int_{-\infty}^n \frac{X^{y \cdot Z} dt}{X - tY} = \sum_{i=1}^n \left(\frac{(x^4 - i)^3}{\sqrt{Z^3 + y^{10}}} \right) \frac{1}{Z - X^5 Y}$$

A,

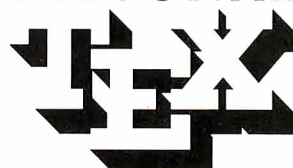
b,

c,

TEST DRIVE IT.

For a free PC T_EX demo diskette, the new PC T_EX 88 product catalog and information on a PC T_EX configuration for your system, give us a call at
415-388-8853

PERSONAL



INC

12 Madrona Ave. Mill Valley CA 94941

VOR O O O O O M !

PC T_EX is a registered TM of Personal T_EX, Inc. T_EX is an American Mathematical Society TM. Manufacturer's product names are their TMs. Inquire about PTI distributorships. Site licenses available to qualified organizations. This ad was typeset using PC T_EX and Bitstream fonts.

Leprecard Hard Disk Cards

Leprecards feature components utilizing the latest technology. Low power drives mean less strain on your systems, lower operating temperature, and longer component life. You get a 1 year warranty, unlimited technical support, and our illustrated installation and user's guide. Models available for IBM PC/XT and compatibles, as well as TANDY 1000/A/SX/TX/TL/SL.

FREE SOFTWARE Including TakeTwo, the backup utility PC MAGAZINE named Editors Choice in 1986 & 1987, and PC-KWIK disk caching from Multisoft.

21MB 48ms	32MB 48ms	32MB 40ms	49MB 28ms*	65MB 16ms*
\$299	\$339	\$389	\$549	\$649

* Average access speed per partition

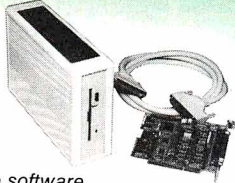
Tandy 1000/A/SX/TX/TL/SL Leprecards add \$20

3.5" Floppy Kits

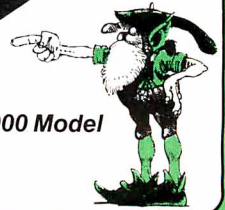
Internal kits for PC/XT/AT computers include 5 1/4" mounting brackets, black & gray face plates, and AT rails. 1.44MB for PC/XT includes high speed Western Digital controller.

FREE TAKE TWO floppy backup software.

720 Kit	1.44MB for AT	1.44MB for PC/XT
\$109	\$139	\$199



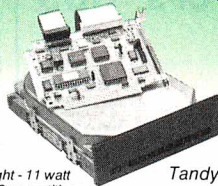
Tandy 1000 Model



PC/XT Disk Kits

- Pretested & formatted
- Western Digital short slot controller
- 30 page installation guide & reference manual
- Cables, mounting screws, full & half-height face plates
- 1 year Warranty, 30 Day Money Back Guarantee
- Optional: 150 watt, UL/FCC approved power supply for IBM PC's \$69

20MB KIT	\$279
• Seagate ST225 - 21.4MB/65ms. Half-Height/14.8 watts	
30MB KIT	\$299
• Seagate ST238 - 32.7MB/65ms. Half-Height/14.8 watts	
40MB KIT	\$459
• Seagate ST251 42.8MB - Half-Height - 11 watt	
• pre formatted into a pair of 21MB/28ms partitions.	
65MB KIT	\$549
• Seagate ST277R 65.5MB - Half-Height - 11 watts	
• pre formatted into a pair of 32MB/28ms partitions.	



Tandy 1000 kits add \$20

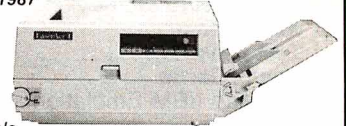
FREE SOFTWARE Including TakeTwo, the backup utility PC MAGAZINE named Editors Choice in 1986 & 1987, & PC-KWIK disk caching from Multisoft.

Laser Printer

"One of the Laserjet's strongest competitors"
INFOWORLD October 5, 1987

- Printer utility software
- Serial and Parallel Interfaces
- 120 day TRW on site maintenance
- 1 year Warranty
- 100% HP Laserjet, & Laserjet + compatible
- 9 resident & 5 downloadable soft fonts standard
- Options: All HP style font cartridges

512K	1.5MB
\$1495	\$1595



Toner Cartridge \$29

AT Hard Disk Kits

- Includes IBM AT rails, and cables.
- SpeedStor or Ontrack large drive software.
- Formatted, Partitioned & Tested.

SIZE	MODEL	SPEED	CAPACITY	PRICE
HH	Seagate ST251	40ms	42MB	\$359
HH	Seagate ST251-1	30ms	42MB	\$449
HH	Toshiba Drive MK134	25ms	44MB	\$499
FH	Seagate ST4096	28ms	80MB	\$599
FH	Maxtor 1140	27ms	117MB	\$1669
FH	Maxtor 2190	30ms	150MB	\$1999

LepreFAX Modems

- Easy to use POP-up Menus
- Sends ASCII or word processing files
- Internal 4800bps, \$289 9600bps \$559
- Prints on standard dot-matrix or laser printers
- Sends/Receives from any Group 3 fax machine
- Automated sending during low phone rate periods
- Portable external plugs into PC/XT/AT serial port. \$359

External
\$359

Internal
\$289



4" Hand Scanner with HALO DPE software \$269

2400 Modems

with MNP

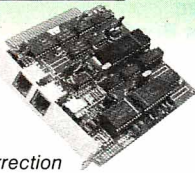
External Internal
\$239 \$229

Hayes Compatible,
300/1200/2400

MNP Level 4 error correction

FREE MIRROR II Software, a \$69 value
Internal model \$229, fits in a short slot

2400 without MNP \$159 Ext \$109 Int



Orchid

Designer VGA 512K	\$299
Orchid VGA 256K	\$249
Tiny Turbo 286	\$289
Ramquest II 1MB	\$799



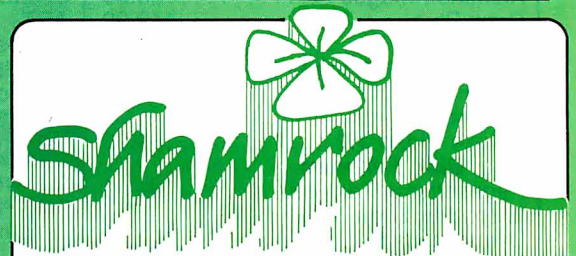
\$895

286¹⁰ Computer

80286 processor running at 6/10 Mhz with 0 wait states provides a Norton SI rating of 11.5. 8 slots - Room for 1 full and 3 half-height drives-220 watt power supply - clock/calendar - Choice of 1.2 or 1.44MB floppy drive-Genuine Western Digital combination Hard disk/floppy controller-American made Maxiswitch 84 or 101 key keyboard - 512K RAM standard expandable to 1MB Award BIOS- 1 year warranty - 30 day money back guarantee.

Complete systems with serial & printer ports:

Mono/Graphics Card & Monitor	\$1095	Orchid VGA Card & Multiscan Monitor	\$1595
VGA Card & Mono Monitor	\$1295	Orchid Designer VGA Card &	
EGA Card & EGA Monitor	\$1495	NEC Multisync II Monitor	\$1895



2524B Townsgate Road, Dept. B, Westlake Village, CA. 91361



To order, or get our
free catalog call

Toll Free
800 722-AT-XT
California
805-373-7847
FAX
805-379-9345

MMC
MEMBER
MICROCOMPUTER
MARKETING COUNCIL
of the Direct Marketing Association, Inc.

- No extra for Visa/Mastercard (AMEX add 3%)
- Prices include UPS surface shipping
- Federal Express shipping just \$1.50 per pound
- 30 Day Money Back Guarantee
- Corporate & Institutional PO's accepted

When you want to talk computers..

ATARI COMPUTERS

800XL 64K Computer	84.99
130XE 132K Computer	139.00
520ST-FM RGB/Color Syst.	789.00
1040ST Color System	Call
SF1224 Color Monitor	329.00
XF551 Disk Drive (XL/XE)	189.00



Atari 800XL & XF551 Disk Drive & Software \$279

Includes: 800XL, 551 Drive, & Star Raiders, Missile Command, Asteroids, Defender, Qix.

ATARI ST SOFTWARE

Access	
Leaderboard Golf	24.99
Accolade	
Test Drive	27.99
Avant Garde	
PC Ditto (IBM Emulation)	64.99
Michtron	
Leatherneck	29.99
Soft Logik Corp.	
Publishing Partner	64.99
Timeworks	
Desktop Publisher	84.99
VIP	
Professional Gem	119.00
Word Perfect Corp.	
Word Perfect	189.00

AMIGA SOFTWARE

Absoft	
AC Basic	139.00
Aegis Development	
Animator/Images	89.99
Draw Plus	149.00
Sonix	49.99
Discovery Software	
Marander II	31.99
Electronic Arts	
Deluxe Video 1.2	89.99
Gold Disk Software	
Pagesetter w/Text ed.	89.99
Micro Illusions	
Dynamic Cad	349.00

AMIGA SOFTWARE

New Tek Inc.	
Digi-View 2.0	149.00
Digi-Paint	44.99
Sub-Logic Corp.	
Flight Simulator II	39.99
Word Perfect Corp.	
Word Perfect	199.00
Word Perfect Library	89.99

MACINTOSH PRODUCTS



OLYMPIA NP-30 Mac 150 CPS \$339

Hard Drives	
CMS	
MacStack 60	899.00
Everex	
40MB SCSI	999.00
60MB Tape Backup	899.00
PCPC	
MacBottom HD45	1149.00
Floppy Drives	
Cutting Edge	
800K Floppy External	189.00
Mirror Technologies	
800K Floppy External	199.00
Monitors	
Network Specialties	
High Top FPD	1199.00
Cornerstone	
SinglePage Display SE	899.00
SinglePage Display II	999.00
Sigma Designs	
Laser View Display for II	1,749.00
Memory Upgrades	
Dove Computer	
Mac Snap 2SE	469.00
Scanners	
AST	
Turboscan	1,349.00
New Image	
MacScan Pro	2495.00

MS/DOS SYSTEMS

Ast Premium 286 & 386	Call
IBM PS/2 25, 30, 50, 60, 80	Call
Leading Edge	899.00

MS/DOS SYSTEMS

NEC APC-IV Powermate	2,399.00
PC-TOO 80286 1.2MB, 512K	899.00
Zenith Laptops	Call



TOSHIBA T-1000 Laptop \$799

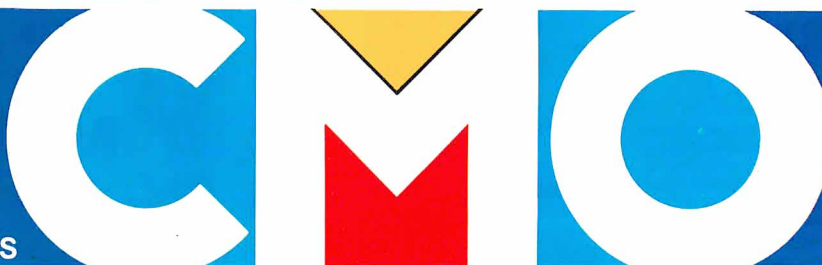
MULTIFUNCTION CARDS

AST	
6-Pak Plus 576 Board	149.00
Hot Shot 286 Accelerator	349.00
Hercules	
Color Card	169.00
Graphics Card Plus	199.00
Intel	
Inboard 386 Board	899.00
5th Generation	
Logical Connection 256K	429.00
Quadram	
Quad386XT 80386 PC-Upgr.	899.00
Video 7	
Vega V.G.A. Adapter	299.00
Zuckerboard	
Color Card w/Parallel Port	89.99

MS/DOS SOFTWARE

Ashton-Tate	
d-Base III +	399.00
Borland	
Quattro	169.00
5th Generation	
Fastback Plus	89.99
Fox Software	
Fox Base & Development	219.00
IMSI	
Optimouse w/dr. Halo	89.99
Logitech	
Hi-Res Buss Mouse	99.00
Lotus	
Lotus 1.2.3	299.00
Software Publishing	
First Choice (Special)	59.99
Word Perfect Corp.	
Word Perfect 5.0	229.00

WE SHIP 90%
OF ALL ORDERS
WITHIN 24 HOURS



SELECT FROM
OVER 3000
PRODUCTS

COMPUTER MAIL ORDER

.....When you want to talk price.

MONITORS

Amdek
Video 210A 12" Amber89.00
Video 410 12" A/G/W(ea.) 149.00
Magnavox
7BM623 12" TTL Amber79.99
CM8505 14" RGB/Composite .189.00
CM8515 14" RGB/Composite .269.00
9CM053 14" EGA.....379.00
9CM082 14" VGA Display....429.00
NEC
GS-1400 14" Monochr. TTL .219.00
JC-1402 Multisync-II619.00
Packard Bell
PB-1418F 14" Flat TTL A/G/W
.....(ea.) 119.00
PB-1420CG 14" Mid-Res CGA 269.00
PB-1422EG 14" Hi-Res EGA .369.00
PB-8426-MJ Uniscan Monitor .399.00
Princeton Graphics
Max-12 12" TTL Amber149.00
Seiko
CM-1430 14"VGA Display649.00



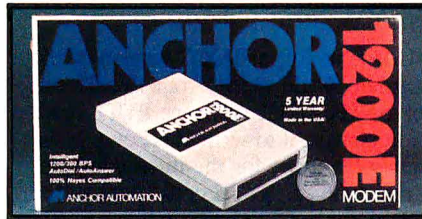
**Magnavox CM 8762
14" RGB/Comp. \$269**

DRIVES

Atari
AA314 DS/DD ST Disk219.00
SHD204 20MB ST Hard Drive .619.00
C.LTD (For Amiga)
C.LTD 20MB (A2000)769.00
C.LTD 33MB (A2000)879.00
C.LTD 44MB (A2000)1099.00
C.LTD 50MB (A2000)1139.00
C.LTD A500 SCSI Controller .179.00
Indus
GT Disk Drive Atari XL/XE...199.00
GTS-100 ST Drive219.00
Sysgen
Bridgefile 5 1/4".....259.00
Seagate Technologies
ST-225 20MB Drive249.00
Supra
Atari ST 30 Meg Hard Drive .689.00
Amiga 2000 20MB Hard/Drive .629.00

MODEMS

Anchor
6480 C64/128 1200 Baud99.99
520 ST520/1040 1200 Baud .129.00
1200E 1200 Baud Internal75.99
Atari
XMM301 XL/XE 300 Baud44.99
SX-212 St Modem89.99
Avatec
1200 Hc External99.99
2400 External179.00
Best Products
2400 Baud 1/2 Card w/software 149.00
Everex
Evercom 2400 Baud External .209.00



**Anchor 1200 Baud
External \$99**

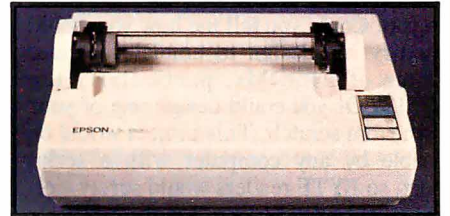
Hayes
Smartmodem 300 Ext.159.00
Smartmodem 1200 Int.279.00
Packard Bell
1200 External89.99
2400 External169.00
Practical Peripherals
1200 Baud Internal.....79.99
2400 Baud Stand Alone.....189.00
Supra
2400AT 2400 Baud Atari169.00
U.S. Robotics
Direct 1200 Baud External109.00
Direct 2400 Baud External199.00

DISKETTES

Maxwell
MD1-M SS/DD 5 1/4"8.49
MD2-DM DS/DD 5 1/4"9.49
MF1-DDM SS/DD 3 1/2"12.49
MF2-DDM DS/DD 3 1/2"18.49
MC-6000 DC-600 Tape23.99
Sony
MD1D SS/DD 5 1/2"6.99
MD2D DS/DD 5 1/2"7.99
MFD-1DD SS/DD 3 1/2"11.99
MFD-2DD DS/DD 3 1/2"16.99

PRINTERS

Atari
XDM-121 Letter Quality XL-XE 209.00
XM-M801 XL-XE Dot Matrix .199.00
XM-M804 ST Dot Matrix.....199.00
Brother
M-1509 180cps 132col.....389.00
HR-20 22cps Daisywheel.....379.00
Citizen
120D 120cps Dot Matrix.....159.00
Premier-35 35cps Daisywheel .549.00
Epson
FX-850 240cps, 80 col.....Call
FX-1050 264cps, 132 colCall
LQ-500 180 cps, 24-wireCall
LQ-850 330 cps, 80 colCall
LQ-1050 330 cps, 24-wireCall
FX-850, FX-1050.....New
Hewlett-Packard
2225A Thinkjet369.00
NEC
P2200 Pinwriter 24-wire379.00
P5200 265 cps, 24-wire.....599.00
P5300 265 cps, 132 col.....789.00
Okidata
Okimate 20 color printer129.00
ML-182 180 cps, 80 col249.00
ML-320 300 cps, 80 col379.00
ML-390 24 wire, 270 cps519.00



**Epson LX-800
150 CPS
Dot Matrix \$189**

Panasonic
KX-P1080i 144 cps, 80 col...169.00
KX-P1091i 194 cps, 80 col...199.00
KX-P1092i 240 cps, 80 col...339.00
KX-P1595 200 cps, 132 col...479.00
Star Micronics
NX-1000 140 cps, 80 col179.00
NX-1000C C64/128 Interface .179.00
NX-15 120 cps, 132 col329.00
Toshiba
P321-SL 216 cps, 24-wire479.00
P351-SX 300 cps, 24-wire999.00

In the U.S.A. and in Canada

Call toll-free: 1-800-233-8950

Outside the U.S.A. call 717-327-9575, Fax 717-327-1217

Educational, Governmental and Corporate Organizations call toll-free 1-800-221-4283
CMO, 101 Reighard Ave., Dept. A1, Williamsport, PA 17701

MEMBER
MMC
MICROCOMPUTER
MARKETING COUNCIL
of the Direct Marketing Association, Inc.

OVER 350,000 SATISFIED CUSTOMERS • ALL MAJOR CREDIT CARDS ACCEPTED • CREDIT CARDS ARE NOT CHARGED UNTIL WE SHIP

POLICY: Add 3% (minimum \$7.00) shipping and handling. Larger shipments may require additional charges. Personal and company checks require 3 weeks to clear. For faster delivery, use your credit card or send cashier's check or bank money order. Credit cards are not charged until we ship. Pennsylvania and Maryland residents add appropriate sales tax. All prices are U.S.A. prices and are subject to change, and all items are subject to availability. Defective software will be replaced with the same item only. Hardware will be replaced or repaired at our discretion within the terms and limits of the manufacturer's warranty. We cannot guarantee compatibility. All sales are final and returned shipments are subject to a restocking fee. We are not responsible for typographic or photographic errors.

ASK BYTE

Circuit Cellar's Steve Ciarcia answers your questions on microcomputing

An EPROM Emulator

Dear Steve,

I am writing for two reasons.

First, I have an EPROM board with its own operating system, but the "burn-test-debug-burn" cycle is a chore, and I'm losing EPROMs in the process. Stuart R. Ball's emulator ("Build the Emulo-8," April 1986) is almost the ideal solution; it emulates EPROMs from 2716 up to 2764, but my needs are for 27128s to 27512s.

Since Mr. Ball's article was published more than 2 years ago, I'm not sure that he is at the same address, so I'm writing to you. Could you tell me how you would modify his design to emulate a wider range of EPROMs, particularly the 27512? Or you could design one of your own from scratch. This project would be usable by any computer with a serial port, so BYTE readers would surely welcome it. I would like to see the emulator do the following:

- Emulate the full range of EPROMs currently on the market.
- Provide a maximum of 64K bytes of RAM for socketed chips (e.g., eight 6264s). You shouldn't have to install the entire 64K bytes of memory. Regardless of what amount of memory you install, it would be mapped in a single, contiguous block. You would install the correct number of 6264s (eight, four, or two), depending on whether a 27512, 27256, or 27128 was being emulated.
- Direct output to a specific 6264 RAM chip. A user-written assembly language program on the host computer would prompt for the number of 8K-byte blocks to be transferred. From the default start address, the program would transfer a block of data over the serial port. At the end of each block transfer, the emulator would switch to the next chip and download the next block until the designated number of blocks had been transferred. I foresee that, when debugging a ROMable development project, I could change a specific byte in a selected chip. In this way, I could download, test, return to the host, correct the error, and download

however many bytes were required to fix the bug.

Undoubtedly, a BASIC version of the program would come from the Circuit Cellar. You could challenge BYTE readers to convert it to write their own in assembly language for the microcomputer of their choice. BYTE could publish the best of the lot, and the authors would place them in the public domain.

Regarding my second question: Often,

IN ASK BYTE, Steve Ciarcia, a computer consultant and electronics engineer, answers questions on any area of microcomputing and his Circuit Cellar projects. The most representative questions will be answered and published. Send your inquiry to

*Ask BYTE
One Phoenix Mill Lane
Peterborough, NH 03458*

Due to the high volume of inquiries, we cannot guarantee a personal reply. All letters and photographs become the property of Steve Ciarcia and cannot be returned.

The Ask BYTE staff includes manager Harv Weiner and researchers Eric Albert, Tom Cantrell, Bill Curlew, Ken Davidson, Jeannette Dojan, Jon Elson, Frank Kuechmann, Tim McDonough, Edward Nisley, Dick Sawyer, Robert Stek, and Mark Voorhees.

I have read in the pages of BYTE and other computer periodicals that most knowledgeable engineers agree that the MC68000 processor family is superior to the iAPX. Though the 68000's superiority is arguable, no one denies that its linear memory addressing is easier to program than the 80x86's segmented memory.

Your Circuit Cellar designs usually use the latest chips, but I have yet to see one designed around a member of the MC68000 family. In recent years, you have given us ZAP (Z80), the SB180 (HD64180 running Z-System), MPX-16 (8088 running CP/M-86 and MS-DOS), and the CCAT (POACH 80286 running MS-DOS). If there is a bias in favor of the Intel chips, please tell us why. If not, it

should be a challenge for you to design a 68000-based computer.

*Basil Johnson
Nepean, Ontario, Canada*

Stuart R. Ball's design can be readily modified to accommodate larger EPROMs. To emulate a 27512, you need 16 address lines; the published design has 12 driven by IC2, a 4040 12-bit binary counter, and a 13th driven by half of IC9, a D flip-flop clocked by the last stage of IC2. The simplest way to get the 16 address lines is to replace IC2 and half of IC9 with two 74LS393 (or similar—e.g., 74HC393, 74HCT393) dual binary counters. These counters are cascaded in such a fashion that the high-order output of one counter drives the input of the next-higher counter. The 16 outputs of these counters become address lines, which can be buffered in the same way as the ones shown in Mr. Ball's design. You should add another 74LS244 package to the design in order to handle the extra lines. You could use multiplexers such as 74LS157s in place of the 74LS244 packages to allow control of RAM addresses from two sources.

For the additional RAM, the simplest route would be to use two 43256 32K-byte by 8-bit chips. The A15 line low enables one RAM, and A15 high enables the other (you'll need an inverter here). Given the relatively low cost of 43256s from sources such as Jameco and JDR (about \$12), this approach makes considerable economic sense. A somewhat more complex approach, closer to your description, would use a 74LS138 decoder with select inputs that are driven by A13-A15. The eight outputs of the '138 each enable a 6264 or similar 8K-byte by 8-bit RAM chip.

A reasonable way to add address selection to this design would be to replace the two 74LS393 counters with four 74LS161 presettable counters, with A-F readout thumbwheel switches to select the count, and a debounced push button activating the LOAD inputs of the counters to set the value selected onto the address lines.

continued

INTERACTIVE
386/ix

The Choice is Clear.

UNIX[®] Checklist for 386 systems

- ☒ **Leading Edge Technology:** First to bring UNIX to 386, first to bring MS-DOS to UNIX, first with X Window, NFS and host-based TCP/IP for the 386.
- ☒ **Optimized For Business:** Mature and popular environment supporting thousands of commercial applications. Backed by comprehensive support and training.
- ☒ **Standard:** UNIX System V certified. Committed to meet emerging POSIX and X/OPEN standards. MS-DOS[®] and XENIX[®] applications run, too.
- ☒ **Outstanding Industry Track Record:** UNIX technology supplier to IBM, Int AT&T, Prime, NCR, Microsoft, Wang, Apollo and others.
- ☒ **Excellent Price/Performance:** pricing and...

INTERACTIVE
A KODAK COMPANY

1-800-537-5324

INTERACTIVE
Systems Corporation
2401 Colorado Avenue
Santa Monica, CA
90404

UNIX is a registered trademark of AT&T.
386/ix is a trademark of INTERACTIVE
Systems Corporation.
MS-DOS and XENIX are registered
trademarks of Microsoft Corporation.
©1988 INTERACTIVE Systems Corporation.

DADiSP..

Let Your Instruments
Do The Talking.™



Talk to your instruments with **DADiSP-488**. Use over 150 functions to display and analyze your waveforms, as easy as typing a name. Run external data acquisition software, or *your own analysis programs*. Create new functions with **DADiSP Macros**.



the First Spreadsheet
designed exclusively for
Scientists and Engineers.

(617) 577-1133

Ask about DADiSP for IBM-PC/XT/AT, DEC MicroVAX, HP9000, Masscomp 5000, and Sun Workstations. For further information write DSP Development Corporation, One Kendall Square, Cambridge, MA 02139, (617) 577-1133

Mention this magazine and receive an Evaluation Disk FREE. A \$20 value.



ASK BYTE

With these simple modifications, you can extend Ball's design to the size you require and incorporate the features you want.

On to your second question. The Intel versus Motorola debate has been an endless one. In general, programmers seem to prefer the orthogonal architecture of the 68000 series, although there are many less vocal programmers who like the 80x86 series best. The content of the debate is frequently misleading; for example, the 68000's virtue of linear memory is eliminated when you use the 68451 or 68851 memory management units, since they segment or page memory. The net effect is like Intel, with extra hardware to get it. Thus, the 68000 series doesn't always have linear memory.

While I might, with unlimited resources, be tempted to develop a 68000-series design, there are a number of reasons for not doing so in the real world. Engineers like myself tend to be more interested in hardware than software, and the 68000 requires more attention to software. To cover development costs, I would need to think in terms of commercial products. Products require support, and that means a knowledgeable staff. All these expenses would need to be covered by sales, and Motorola isn't doing all that well against Intel in the volume industrial markets that spell the difference between success and bankruptcy.

Additional reasons for going with Intel for designs like the CCAT include the relatively low cost of designing for MS-DOS as opposed to, for example, OS-9. My staff is already experienced and familiar with the chips we work with; I have access to less expertise in the 68000 arena, and developing that expertise would require resources best expended in other directions at the present time. The market outlook for a 68000 design is rather limited, and too many people fighting over too small a pie makes us all starve. With all this said, however, there is an ongoing project based on the 68000 in Circuit Cellar INK.

For two ways to convert 68000 designs to use 68020s, see the June 20, 1985, and January 9, 1986, issues of EDN.—Steve

Too Many Files

Dear Steve,

I've been trying for months to find an explanation for a Too Many Files Open message from the operating system while it's running a COM file from a Turbo Pascal source code.

The boot disk has a CONFIG.SYS with the lines FILES=30 and BUFFERS=30. The DOS manual doesn't

say anything about how to fix this error, and for this particular application I need more than 15 files opened simultaneously (15 is the maximum number of files I get before the message appears).

Is there some way to fix this error?

Santiago Lopez
Tampico, Mexico

Your Too Many Files Open problem is due to the limit DOS places on the number of file handles that can be open at one time. This limit is either the default 8 if you don't specify a different number in your CONFIG.SYS file, the number you specify, or 20—whichever is smaller. In other words, you cannot have more than 15 files open at one time in any version earlier than DOS 3.3, no matter what you put into the CONFIG.SYS file.

Now, why only 15? Well, DOS takes the first five for the DOS devices stdin (keyboard), stdout (screen), stdprn, stderr, and aux or com1. This leaves 15 handles for you.

It is possible to open more files using DOS versions earlier than 3.3 by building your own file control blocks. See the IBM DOS technical reference manual for details on this method of opening files. This is complicated using Turbo Pascal, but I believe it is possible.

If you can run DOS 3.3, you can increase the number of allowable handles for your program by using DOS function 67H (set handle count). You'll still have to set the FILES= statement in CONFIG.SYS to allow the larger number of handles. Again, see the IBM DOS 3.3 technical reference manual for details.

The more common method of getting around this problem is to open files when needed and close them when they're not in use. Remember that when opening a file to write to it, you will need to open the file in append mode to prevent losing all previously written data.—Steve

The Mysterious Vanishing Graphics

Dear Steve,

I am a Spanish computer enthusiast. I have an old Commodore-64 and a Sinclair Spectrum. I think I understand these machines well, so I decided to acquire an IBM PC compatible, and I bought Commodore's PC 10-II. Then some friends sent me some programs, two of which were Summer Games and Winter Games.

That's when the problem started: I have to reset my PC to run the games, because the program starts at sector 0. In other PC compatibles, the games work right, but when I tried to run them on my

continued

TALLGRASS BACKS YOU ALL THE WAY.



*Tallgrass makes
internal and external
tape backup systems
for the IBM PC/XT/AT,
PS/2 or compatibles,
and an external
unit for your Mac
Plus, SE or II.*

We've got a whole new family of tape backup systems.

Whether you've got an IBM, a compatible, or a Macintosh, you can count on Tallgrass. We back you with all the storage capacity you could ask for, plus all the features, all the support, and all the speed you'll ever need. And we make it easy to protect your valuable data. Since all operations are automatic

and unattended, you can just set it, and forget it.

Best of all, we stand behind our products with the industry's only 3-year warranty.

But there's one other reason why so many more people are asking for Tallgrass. It's because the competition is asking so much more for their products.

Let Tallgrass start backing you up.
Call 1-800-TAL-GRAS. Or write to:
Tallgrass Technologies, Inc.
11100 West 82nd St.
Overland Park, KS 66214

TALLGRASS
TECHNOLOGIES

When it's worth saving, it's worth Tallgrass

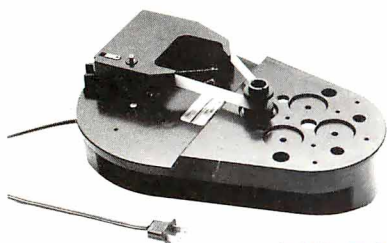
© 1988 Tallgrass Technologies, Inc. "IBM" is a registered trademark of International Business Machines, Inc. "Macintosh" and "Mac Plus" are trademarks of Apple Computer, Inc.

Circle 280 on Reader Service Card (DEALERS: 281)

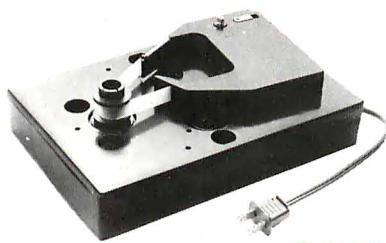
DECEMBER 1988 • BYTE 43

Never buy another ribbon! with MacInker™

over 100,000 sold



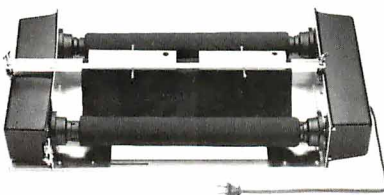
Universal Cartridge MacInker **\$68.50**



Imagewriter or Epson MacInker **\$42.00**

Eliminate expensive ribbon replacement with the famous MacInker. The Universal Cartridge MacInker (\$68.50) will re-ink most cartridges with the appropriate adaptor. The Universal Spool MacInker will re-ink all spools. Operation is very simple & automatic. Our extra dark, lubricated ink yields better than new printout quality and its cooling effect extends print-head life. New ink dispenser ensures precise ink metering. Average number of re-inkings/cartridge is 60-100 at an average cost of 5cents/re-inking. We also have dedicated MacInkers for special cartridges. All MacInkers, with appropriate Multicolor Adaptor can re-ink multicolor cartridges (2 or 4 colors). Or use your MacInker to re-ink in 10 different colors: red, green, blue, yellow, purple, brown, orange, gold and silver. Our Customers range from individuals to Fortune 500 Corporations. In 1982 we pioneered re-inking technology and are dedicated to its development. We have a complete range of accessories, heat-transfer re-inking adaptors, special inks and cartridges.

New



Band Printer MacInker **\$299.00**

Universal Cartridge MacInker68.50
Multicolor Adaptor (specify printer)40.00
Imagewriter I/I MacInker mod 234 IM.....42.00
Epson MacInker mod 271EP42.00
Universal Spool MacInker68.50
Heat Transfer Adaptor40.00
Extra Ink bottle3.00 pint18.50

All MacInkers delivered with bottle of ink, ink meter, reservoir, reservoir cover.
Black, uninked, colored, special cartridges available. Best ribbon quality at lowest costs.

Call for free catalog

Special Offer

Just say, "I saw it in 'Byte' and get a free mousepad with any order >\$60.00, or free key-beeper & flashlight combination for orders >\$100.00.

Buy the Universal Cartridge & the Universal Spool at the same time and get the second unit for \$50.00

Multiuser Printer Buffers

Let us configure the most economic & efficient buffer set-up when using two printers with one computer or two computers and two printers. We have the most complete range of buffers, converters, switches, cables & custom cables. Award winning Proteus switches manually or by software between 2 printers. Memory is automatically partitioned & both printers can print simultaneously.

UG-411, 1 comp. / 1 printer 64k160.00
256k.....230.00
UG-402 2 comp. / 2 printers 64k.....199.00
256k.....240.00
PROTEUS, 1 comp. / 2 printers 64k.....199.00
256k.....240.00
UG-403 4 comp. / 2 printers 256k.....275.00
UG-408 4 comp. / 4 printers 512k.....375.00
UG-412 Serial buffer card 1 MEG500.00
CBL-715 Univ. ser-par-ser converter159.00
CBL-705 Ser-par converter99.00
Autoscanning switches (4 to 1)169.00



UG-402



Proteus

Satisfaction or 30 day refund on all products - Immediate shipment - Major credit cards

Computer Friends, Inc. Order Toll Free 1-800-547-3303

14250 NW Science Park Dr.
Portland OR 97229

in Oregon (503)626-2291
fax (503)643-5679 telex 4949559 CF

ASK BYTE

Commodore, I couldn't see any graphics, because I must run VSET before working in graphics mode (when you reset the PC 10-11, it sets itself up in text mode).

What can I do to set the advanced graphics adapter to remain in emulation text mode? There should be a way to do it, perhaps by changing the reset routine.

I have a second question. I would like to send tones down a wire—the telephone line, for example—and I'd like to choose those tones from those shown in table 1. The tones work in the U.S. systems, and I believe they work here in Spain as well. They must be within 30 Hz of the frequencies I've shown and should have distortion of less than 1 percent. What equipment should I use?

Jordi Roca Mas
Tarragona, Spain

Table 1: List of requested frequencies.

Tone	Number frequency
1	2600 Hz
2	1740 & 1980 Hz
3	1860 & 1980 Hz
4	1380 & 1500 Hz
5	1380 & 1620 Hz
6	1500 & 1620 Hz
7	1380 & 1740 Hz
8	1500 & 1740 Hz
9	1620 & 1740 Hz
10	1380 & 1860 Hz
11	1500 & 1860 Hz
12	1620 & 1860 Hz
13	1740 & 1860 Hz

There are often variations in the way similar computers function, and DOS is often "customized" by manufacturers; these differences and changes can create problems. There is no certainty, but you can probably solve your problems with the Commodore graphics adapter display modes by using the MS-DOS mode command. You can issue the appropriate commands from the keyboard or in a batch file (see table 2). Check the MS-DOS manuals for more information.

You can find information on DTMF tone encoding/decoding in the December 1981 Circuit Cellar, which can also be found in volume II of the reprints under the same title published by BYTE books. National Semiconductor's 1982 Linear Data book contains specifications and

continued

THE \$29 MONEY MANAGEMENT SOLUTION.

"An exceptional value."
Tom Badgett, PC Clones

MONEYCOUNTS 5.0

The Highly Acclaimed
Accounting Money
Program For IBM or
Compatible Computers

**"I was impressed.
It wins the cost-effective award."**

John Dvorak, PC Magazine

**"This is a great program: logical, easy
to learn, and fast and easy to use."**
Lloyd Edwards, Palmetto PC Chronicles

**"This program has all the features
and capabilities of money management
programs costing 10 times as much."**

Leonard Hyre, PCM Magazine

GUARANTEED.

If you're looking for a complete money management/accounting program that offers outstanding value, we invite you to examine the evidence on MONEYCOUNTS. **It's the clear choice for home and business.**

MONEYCOUNTS is CPA designed, easy to use, menu-driven with on-line help, and requires no accounting experience. You'll appreciate the ease with which MONEYCOUNTS 5.0. . . .

- Manages your cash, checking, savings, & credit cards
- Prepares your budget
- Balances your checkbook
- Prints 5 types of financial statements (including net worth)
- Prints 6 types of inquiry reports
- Prints any type of pin-feed check & updates your records automatically
- Prints general ledger & accountant's trial balance
- Handles up to 999 accounts & 100,000 transactions a year with its fast financial data base
- Estimates your 1988 personal income tax
- Analyzes financing options & savings programs — computes interest rates & loan payments — prints amortization and accumulation schedules
- Manages mail lists — zip and alpha sorts — prints labels and index cards
- Displays and prints three-dimensional graphics — works with monochrome or color monitors
- Provides password protection, fiscal year support, pop-up notepad, and much more!

Hard to believe the low price? Don't worry! There's no catch. MONEYCOUNTS has a proven track record, has been on the market over four years, and is continuously receiving rave reviews. **If you're not 100% satisfied, return MONEYCOUNTS within 30 days for a full refund** (excluding shipping). Over 50,000 users have decided in favor of MONEYCOUNTS! Order today and judge for yourself!

For Same Day Shipping

VISA, MASTERCARD & C.O.D. ORDERS CALL

1-800-223-6925

(In Canada, call 319/395-7300)

Weekdays 8:30 a.m. to 9:00 p.m. CST

Saturdays 9:00 a.m. to 5:00 p.m. .

Or send check or money order payable to Parsons Technology.



375 Collins Road N.E.
Cedar Rapids, Iowa 52402

Circle 210 on Reader Service Card



Dept. B
375 Collins Road NE
Cedar Rapids, Iowa 52402

MONEYCOUNTS®
Version 5.0
\$29 + \$5 shipping

NOT COPY PROTECTED
INCLUDES PRINTED MANUAL

NAME _____

ADDRESS _____

CITY _____

STATE/ZIP _____ PHONE _____

CHECK ☐ MONEY ORDER ☐ VISA ☐ MASTERCARD ☐

CARD # _____ EXP. DATE _____

MONEYCOUNTS 5.0 requires an IBM or compatible computer, 256K or more RAM, DOS 2.0 or higher, 2 disk drives (or a hard disk). Add \$5 shipping/handling — \$10 outside North America. Iowa residents, please add 4% sales tax.

DAZZLING PERFORMANCE.



'286/SS

COMPLETE 12MHz '286 WITH 32MB HARD DRIVE ONLY \$1295.00

- 80286 CPU, 6/12 MHz Dual Speed, Keyboard Selectable.
- Zero-Wait State RAM, 512K expandable to 4MB on the motherboard (16MB System Total).
- 32MB Hard Drive, 1.2MB Floppy Drive.
- Ultra high speed Hard/Floppy controller. 1:1 interleave, 800 KB/sec transfer rate.
- High Res 12" Amber Display with Tilt and Swivel Base. Compatible graphics controller.
- ZEOS Enhanced Keyboard, Pleasant Tactile/Click Feel.
- Serial and Parallel Printer Ports.
- Clock/Calendar with Battery Backup.
- 6-16 and 2-8 bit expansion slots.
- 80287 support, up to 12 MHz.
- Space Saver Case with Security Lock, LED indicators.

12MHz, 16MHz and 20MHz '286 HARD DRIVE SYSTEMS

As high as 20MHz! Dazzling performance is yours with one of these high performance full size ZEOS '286 Systems.

Each comes *complete* with our standard features including drives, monitor, high speed controller, etc. Our full size case features room for up to 5 half-high drives, two of which are internal. Incredible values.

■ **286/12**—Complete 12 MHz System with 512K of Zero-Wait RAM, High Speed 32MB Hard Drive and all the standard ZEOS goodies. **ONLY \$1395.00**

■ **286/16**—Complete 16MHz system with 1MB RAM on board and High Speed 32MB Hard Drive. *Faster than a '386 16MHz* when running 16-bit software! **ONLY \$1895.00**

■ **286/20**—At 20MHz, it's the fastest. Complete with our 32 MB, High Speed Hard Drive and 1MB RAM. This is what Dazzling Speed is all about. **ONLY \$2095.00**



'286/FS

DAZZLING PERFORMANCE. INCREDIBLE PRICES.

Can you believe it? *Yes, you can!*

We've proven it to thousands and we would like to prove it to you. ZEOS® systems are sold *complete*, ready to plug in and fly right out of the box. And the quality

and prices are incredible.

How is it possible? Because your ZEOS computer comes to you *factory direct*, fully assembled, burned-in and tested in our own laboratories. Every system is built to order. Custom built actually, right to your own specifications.

And our quality and performance are second to none.

We don't just say it. We guarantee it. That's why your new ZEOS system comes with a Full One Year Limited Warranty and our 30 day Full Refund Satisfaction Guarantee.

So pick out your dream

INCREDIBLE PRICES.



COMPLETE 16MHz '386 DESKTOP WITH 32MB HARD DRIVE.

ONLY \$2495.00
(20MHz add \$500)

- Genuine 32-bit Intel 80386, 16 or 20MHz parts.
- 1MB of RAM Expandable to 16MB.
- 32MB, High Speed Hard Drive, 1.2MB floppy drive.
- Ultra high speed Hard/Floppy controller: 1:1 interleave, 800 KB/sec transfer rate!
- High Res 12" Amber Display with Tilt and Swivel Base. Compatible graphics controller.
- 101 Key ZEOS Tactile Click keyboard.
- Serial and Parallel/Printer Ports.
- Clock/Calendar with Battery Backup.
- 2-32, 4-16 and 2-8 bit slots.
- 80287 and 80387 support.

'386/SS

COMPLETE '386 VERTICAL SYSTEM. 64MB DRIVE!

ONLY \$2995.00
(20MHz add \$500)

Acknowledged worldwide as the highest performance value anywhere. Same great standard ZEOS features found on our other complete systems plus:

- 64KB Zero-Wait CACHE using 64K of SRAM.
- 1MB of 32-bit RAM system expandable up to 16MB.
- 65MB High Speed Seagate Hard Drive.
- 80287 and 80387 optional.
- Heavy Duty Vertical Case.

Call about our new 25MHz systems. Now Shipping!



'386/V

machine and order it now with confidence. Dazzling performance and incredible prices await you. *Guaranteed.* Order now by calling 800-423-5891.

Other ZEOS Options Include:

- Basic Configurations: Call for prices on systems

without drives, etc.

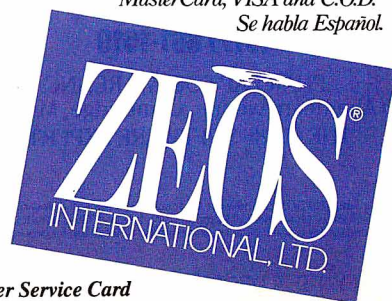
- EGA/VGA Upgrades. 14" EGA color monitor with EGA card, add \$495. 14" VGA system, add only \$695

- High Capacity Drives. Many other drives and options are available. Call Toll Free for details, 800-423-5891

**ORDER NOW TOLL FREE
800-423-5891**

FAX Orders Dial: 612-633-2310
In Minnesota Call: 612-633-4591
530 5th Ave. NW, St. Paul, MN 55112
Open days, evenings and weekends.

MasterCard, VISA and C.O.D.
Se habla Español.



If it's all out warfare in today's software marketplace, you'd better have the best weapons.

Phar Lap 386 development tools. The best weapons.

Phar Lap 80386 development tools let you take full advantage of 386 protected mode architecture. You can break the 640K limit in the language of your choice; C, Fortran, Pascal, or Assembler.

For fast compact code, use 386|ASM, our full-featured 80386 assembler that's upwardly compatible with the MASM* 8086 assembler. Existing DOS and main-frame applications written in a high level language are easily ported by recompiling. And 386|LINK, our 32-bit native mode linker, puts it all together.

Debugging is made easy too. With our 386 symbolic debugger you can debug applications written in assembler or any high level language. Best of all, with Phar Lap's 386|DOS-Extender* you can run your native mode program on any 386-based PC running MS-DOS*. And you have full access to DOS system services through INT 21.

NO COMPATIBILITY PROBLEMS

Phar Lap's tools are compatible with the industry's leading systems: DESKPRO 386*, IBM Model 80*, accelerator boards such as Intel's Inboard* 386 and 386 clones. Not only will your new applications be compatible with the leading systems, they'll run alongside all other DOS applications.

NO ROYALTY PAYMENTS

Once your 386 application is complete, all you pay is a low one-time fee to license 386|DOS-Extender for redistribution. This allows you to embed 386|DOS-Extender in your application so your customers can run it on any 386-based PC. Just one payment and you unlock the entire DOS market. We don't believe in a software tax on every sale.

Don't wait for OS/3, get a jump on the competition today. Choose your weapons now.

- \$495 386|ASM/LINK — Package includes 386 assembler, linker, MINIBUG debugger and 386|DOS-Extender
- \$895 MetaWare 80386 High C* compiler
- \$895 MetaWare 80386 Professional Pascal* compiler
- \$595 MicroWay NDP Fortran-386* compiler
- \$195 386|DEBUG symbolic debugger

(617) 661-1510

PHAR LAP SOFTWARE, INC.
60 Aberdeen Avenue, Cambridge, MA 02138
"THE 80386 SOFTWARE EXPERTS"



Table 2: Mode *command syntax*.

Command	Description
MODE CO80	Sets hi-res graphics, color enabled
MODE CO40	Sets lo-res graphics, color enabled
MODE BW80	Sets hi-res, color disabled
MODE BW40	Sets lo-res, color disabled

applications information for several pertinent ICs.

For information relating specifically to the Spanish phone system, I'd suggest visiting a technical or university library and researching the appropriate CCITT communications standards. —Steve

Gotta Get That RAM

Dear Steve,

Many of us are looking at buying RAM chips on the open market to fill in a variety of boards and projects that come with that little "OK installed" note. However, there is often a question of speed to consider.

Could you give me some idea of the upper limits of the clock speeds that can safely be run with the 150-nanosecond, 120-ns, and 100-ns RAM chips? I'd also appreciate general notes about any "gotchas" that might be hiding in the bushes for us novices, and any ideas about the future of RAM chip speeds.

I noticed that some of the 20-MHz 80386 machines (like the new AST) say they have 13 megabytes of RAM that use one wait state and 64K bytes of cache memory that has no wait states. How fast does cache RAM have to be, or are there other considerations besides RAM speed?

Jeffrey Kutz
Los Angeles, CA

The maximum access time for 2164A memory chips running with an 8086 processor at zero wait states is given in the Intel memory components handbook as shown in table 3. The 12-MHz point is extrapolated from the Intel data. The handbook also shows a sample design using 150-ns chips with an 8086 at 10 MHz.

These times are probably optimized, in that there are likely to be some timing delays due to hardware design that are not accounted for in the Intel calculations.

continued

Phar Lap and 386|DOS-Extender are trademarks of Phar Lap Software, Inc. MS-DOS and MASM are registered trademarks of Microsoft Corp. DESKPRO 386 is a trademark of Compaq Corp. Inboard 386 is a trademark of Intel Corp. NDP Fortran-386 is a trademark of MicroWay, Inc. High C and Professional Pascal are trademarks of MetaWare Incorporated. IBM Model 80 is a trademark of IBM Corp.

Compaq introduces
a revolutionary
new personal computer.
With new display technology.
Breakthrough graphics technology.
Advanced storage technology.
New expansion technology.
Innovative modem technology.
New keyboard technology.
New surface mount technology.
Advanced network technology.



And a battery.



Introducing the new
COMPAQ SLT/286 Personal Computer.
The first PC that puts true
desktop performance in your lap.



When you build a full- there's no room

Before now, choosing a laptop PC meant choosing what you could live without. A manageable size. Battery. Power. Speed. Screen quality. Full-size keys.

We've changed that, with the new COMPAQ SLT/286. It's the first laptop from the company that set the standard in portable computing. And the first laptop to give you everything you want. Without compromise.

Creating a new high-performance PC this small was no small feat. It took a series of engineering breakthroughs to build a smaller laptop that delivers the performance of a desktop—on battery power.

From its compact size to its high-performance components, you'll see that your needs shaped our thinking.

First of all, we knew you wanted to wield a lot of power, without throwing around a lot of weight.

The new COMPAQ SLT/286 weighs in at just 14 lb., with a space-saving footprint. That means



The COMPAQ SLT/286 snaps into an optional Desktop Expansion Base for office use.



A removable keyboard offers your fingers full-size keys, with standard spacing.

it fits on an airline tray table with plenty of room to spare.

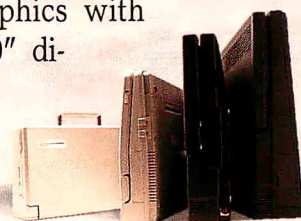
When you're on the road, we won't leave you stranded, either. The COMPAQ SLT/286 uses innovative new battery technology that gives you over three hours of power. The battery is small, so carrying a spare is no problem. Replacement and recharging are fast and easy.

But what's amazing about the battery is everything that runs on it. Every component is optimized to save battery life. So you can work longer.

The COMPAQ SLT/286 has VGA graphics with 640x480 resolution with eight

shades of gray. New backlit screen technology produces text and graphics with higher contrast on a 10" diagonal screen. So things are easy to read.

Now let's take an inside look. The COMPAQ SLT/286 is powered by a 12-MHz



A small wonder. Compared to other laptops, the COMPAQ SLT/286 gives you more PC in less space.

*COMPAQ
SLT/286*

The first laptop from the company that set the standard for portable PCs.

It simply works better.

function PC this small, for compromise.

80C286 microprocessor that drives software 20% faster than most 10-MHz 80286-based PC's. You get the capability to run the world's largest library of software with MS-DOS®. Plus Microsoft® Operating System/2.

Flexibility is built in. You can choose a high-speed 40- or 20-MB fixed disk drive to complement the standard 3 1/2" 1.44-MB diskette drive. Plus you can easily expand the 640K of standard memory to 3.6 megabytes internally.

You'll find our keyboard is just your type. It has full-size keys, spaced just like the keys on a desktop PC. The keyboard is removable, so it adjusts to the way you work. You get all 12 function keys and an embedded numeric keypad. Or if numbers are your life, add a separate numeric keypad as an option.

Other creature comforts are also on board. Like an optional internal 2400-baud modem. Room for two internal storage devices. Ports for a printer, external VGA monitor and other periph-



Its footprint is small enough to fit on an airline tray table, with room to spare.

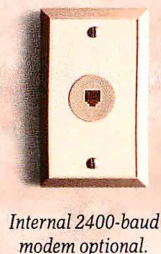
erals. You can even add a 12-MHz 80C287 coprocessor as an option to speed number crunching.

At this point you may be thinking that the COMPAQ SLT/286 does everything a desktop can do. You're right. In fact you can even do more at the office with its optional Desktop Expansion Base.

Unlike competitive expansion units, ours wasn't an afterthought. Its integrated design gives you two industry-standard expansion slots along with duplicate interfaces for your peripherals. The expansion unit even recharges the battery for you.

Best of all, the COMPAQ SLT/286 just snaps right into the Desktop Expansion Base. No cord. No wires. No hassle.

With all these innovative features, you can see that the new COMPAQ SLT/286 leaves absolutely no room for compromise. It's simply high-performance personal computing in its most concentrated form.



Internal 2400-baud modem optional.



Battery included for over three hours of power.

COMPAQ

We have the world's best handle on portable computing.



In 1982, Compaq introduced the world to the power of portable personal computing with the COMPAQ Portable.

Since then we've consistently delivered new levels of performance in consistently smaller packages.

Today we offer the world's highest-performing portable personal computers. COMPAQ products consistently earn the industry's highest ratings for quality and user

satisfaction. And that's an achievement that stands unchallenged.

You'll find that we've built these same uncompromising standards into the new COMPAQ SLT/286.

To get a handle on more information, including a free brochure and the location of your nearest Authorized COMPAQ Computer Dealer, call 1-800-231-0900. Ask for Operator 71. In Canada, 1-800-263-5868, Operator 71.

COMPAQ® is a trademark of Compaq Computer Corporation. Microsoft®, MS® and MS-DOS® are trademarks of Microsoft Corporation. MS® OS/2 is a product of Microsoft Corporation. Product names mentioned herein may be trademarks and/or registered trademarks of their respective companies. *Registered U.S. Patent and Trademark Office. ©1988 Compaq Computer Corporation. All rights reserved. Use of electronic equipment on board commercial aircraft is at the discretion of each airline.

COMPAQ

It simply works better.

ASK BYTE

Table 3: Maximum memory access times with associated CPU clock speeds.

Clock speed (MHz)	Access time (ns)
5	313
8	173
10	138
12	117

In a more conservative vein, IBM used 250-ns chips with zero wait states for normal memory access but one wait state when direct memory access (DMA) is in use at 4.77 MHz. Table 3 would lead you to believe that you don't need the wait state with chips that fast; indeed, some people have run IBM PCs at around 7 MHz with speed-up kits.

The AST Premium/286 is also a little conservative compared to the table. It uses 100-ns chips at 10 MHz with no wait states in the "Fast RAM" slots and one wait state in normal AT-style expansion slots. The AST Fast RAM slots contain a special connector to a bus with direct access to the CPU. The table indicates that 120-ns RAM is fast enough for this machine, but it seems AST thinks differently.

It probably pays to be a little conservative with memory speed, and a practical limit for a zero-wait system probably is 100-ns chips at 10 MHz, possibly pushing to 12 MHz with a very well-made bus and some risk of errors. If one wait state is used, 120-ns chips should be okay at 12 MHz.

The 20-MHz 80386 machines with zero-wait cache RAM use static RAM with access times around 55 ns, which is consistent with the table. There are timing considerations other than access time in designing a memory system, but for estimating, this is good enough. —Steve

Pinning Down a Bug

Dear Steve,

Three months ago, I bought an IBM PC AT board from JDR Microdevices. The system is supposed to work fine at 6 or 8 MHz with one wait state, but since the beginning I have had I/O problems that the retailer has not been able to solve.

Once I've done more than 20 or 40 disk writes, the system crashes completely with a message, RAM parity error... Offending segment 0000. It doesn't happen with a disk read. The BIOS is is-

sued by Award. Otherwise, the system is running fine. I checked the disk controller by exchanging it with another, but I had the same problem, so I suppose it is coming from the same motherboard. How can I determine the cause?

Philippe Wetterwald
Ambler, PA

Exchanging the disk controller pins down the problem to two areas: It's either the system board memory or the interface between the system board and the disk controller, which is usually a timing problem.

The timing for memory operations differs depending on whether the processor is reading instructions, reading data, or performing a DMA operation. In the IBM PC AT, the hard disk doesn't use DMA, so there's actually less trouble with that than with a floppy disk. You don't say which sort of disk you're using, but I'll bet it's a floppy disk.

I suspect that one of the RAM chips in the high-order addresses is "soft" and has a slightly slower timing than the rest. It works OK under normal reads and writes, but fails under the DMA timing. Here's how to track it down.

Your board uses 256K-byte dynamic RAMs, so there are four banks of nine chips each. If you don't have a full megabyte of RAM, there will be one or two empty rows; the problem isn't coming from those unless there's a software bug that tries to read from memory that doesn't exist.

I'll assume that you've got a megabyte of RAM, with all four banks full. Set the configuration so that you've got only 512K bytes of RAM defined, then remove the top two banks. See if the problem still occurs; if it doesn't, the bad chip is in one of the two banks on your desk.

If it still happens, swap one of the banks on the system board for one that you removed, and try again. If it still happens, replace the other system board bank. If that doesn't fix it, you need more help than a letter can provide.

Assuming that you've pinned the bug down to one bank of RAM, replace it. Don't try to isolate it to a single chip—buy nine more chips and replace the whole bank. You'll have eight spare chips (and one dud that you'll have to sort out later) in case a RAM chip dies later on.

If you can't pin it down to a single bank of RAM, there may be two or more slow chips in the lot. Check to make sure that the speed rating (the number after the dash in the part number) is the same for all the chips: If one or two are different, those are the troublemakers. —Steve ■

Solving Your Scientific and Engineering Problems Just Got Simpler

Science & Engineering Software Co. is the only source with all the software you need to solve your specialized problems: Statistical data analysis, circuit design, data acquisition and signal analysis and more.

- No one offers you more variety with over 500 programs.
 - If you don't see a title or know a publisher, we'll find it.
 - We offer a 30-day Money-Back Guarantee*
- Call today and get our solutions working for you!

	LIST	OURS
CIRCUIT DESIGN/SCHEMATIC CAPTURE		
HiWire, Wintek Corp.	\$ 895	805
MICRO-CAP II, Spectrum Software	895	759
Schema II, Omation	495	449
smARTWORK, Wintek Corp.	895	809
Tango PCB, ACCEL Tech.	495	469

DATA ACQUISITION/SIGNAL ANALYSIS		
Asyst	\$2,295	2,065
Asystant Plus	995	849
Asystant	495	449
Asystant GPIB	695	629
DADISP, DSP Systems	795	719
DADISP-488	195	175
Fourier PERSPECTIVE II, Alligator	395	349
LABTECH Notebook	595	799

PLOTTING AND GRAPHING		
Datagraph Graph, Mihalisin Assoc.	\$ 299	259
PC MAP III, Wireless Engineering	795	749
TECH*GRAPH*PAD, binary engineering	395	359

EQUATION SOLVERS		
Eureka: The Solver, Borland	\$ 167	119
MathCAD 2.0, MathSoft	349	279
muMATH, Soft Warehouse	295	199
TK!Solver Plus, Universal Tech Sys.	395	349

CAD		
AutoCAD, Autodesk	\$2,850	CALL
AutoShade	500	475
Autosketch	80	65
Speed Enhanced Version	80	79
Design CAD, American Small Bus. Comp.	299	249
Design CAD 3-D, American Small Bus. Comp.	299	249
Drafix 1 Plus, Foresight	295	215
Drafix 3-D Modeler	295	215
Generic CADD	100	69
Add-Ons	CALL	CALL

SCIENTIFIC TEXT PROCESSING		
EXP, Brooks/Cole Publishing	\$ 150	129
PC TEX, Personal TEX	249	229
T3 Sci. Word Proc., TCI Software Res.	595	499

STATISTICS		
SS, StatSoft	\$ 495	459
GAUSS Math & Stat System	395	359
Microstat II, Ecosoft	395	349
NWA STATPAK, Northwest	399	359
SPSS/PC +	795	749
SYSTAT	595	549
With SYGRAPH	795	709

FORTRAN LANGUAGE		
Lahey F77L FORTRAN	\$ 477	429
Mathpac, Systolic	495	469
Microsoft FORTRAN w/CodeView	450	299
NDP FORTRAN, Microway	595	529
RM/FORTRAN, Austec	595	479
Plotmatic, Microcompilables	135	119

OTHER LANGUAGES		
Smalltalk/V, Digital	\$ 100	85
Smalltalk/V 286	200	179
Microsoft C	450	299
Turbo Pascal 5.0, Borland	150	105

OTHER PROGRAMMING TOOLS		
C TOOLS PLUS, Blaise	\$ 129	99
Turbo C TOOLS	129	99
386MAX, Qualitas	75	66
Periscope III	1,495	1,195
Greenleaf DataWindows	295	209
GraphiC, Scientific Endeavors	395	322
HALO'88, Media Cybernetics	325	229
Sci/Engineering Tools, Quinn Curtis	75	69
Turbo POWER SCREEN, Blaise	129	99

Ordering Information We accept AMERICAN EX. PRESS, MC, VISA and PERSONAL CHECKS. There is no surcharge on credit card or C.O.D. New York State residents must add sales tax. Shipping and handling \$3.95 per item within the U.S. sent UPS ground. Rush and international service available. Call for prevailing rates. • International orders add \$10 for export preparation. • Prices and policies may change without notice. • Dealers and Corporate Buyers call for special rates. • Mail orders must include phone numbers. • Ask for details before you buy, some manufacturers won't take returns if disk seals are broken.

In the U.S. call **1-800-333-3141**
International Orders: **914-332-0756**

Science & Engineering

SOFTWARE CO.

55 South Broadway, Tarrytown, NY 10591

DECEMBER 1988 • BYTE 49

1024X768 IBM COMPATIBLE VGA VIDEO CARD

VGAWONDER™

T H E S E C O N D W O N D E R

1024X768

Plus: VGA, EGA, CGA, MDA & Hercules
on Standard MULTISYNC monitors

Yes! the Phenomenal VGAWONDER does it all at IBM Hardware level compatibility with automatic monitor detect and no dip switches or jumpers to set. A HOT CARD for the 286/386 POWER USER with AUTO BUS DETECT for 8 or 16 bit slots, running with a 16 bit datapath with 1:1 interleave. 100% IBM HARDWARE LEVEL COMPATIBILITY means that ALL software and operating systems designed for IBM systems will run. 1024 WILL BE DISPLAYED IN COLOR ON STANDARD MULTIFREQUENCY MONITORS. Although these features are expected from ATI they are NOT AVAILABLE from other manufacturers. EGA on all monitors including RGB & TTL means a perfect card for networks. MOUSE ON BOARD! ATI built the mouse right in to this one, why not? No extra charge! VGAWONDER is available in both 512K and 256K Versions. Ask your dealer for more information.



TECHNOLOGIES INC.

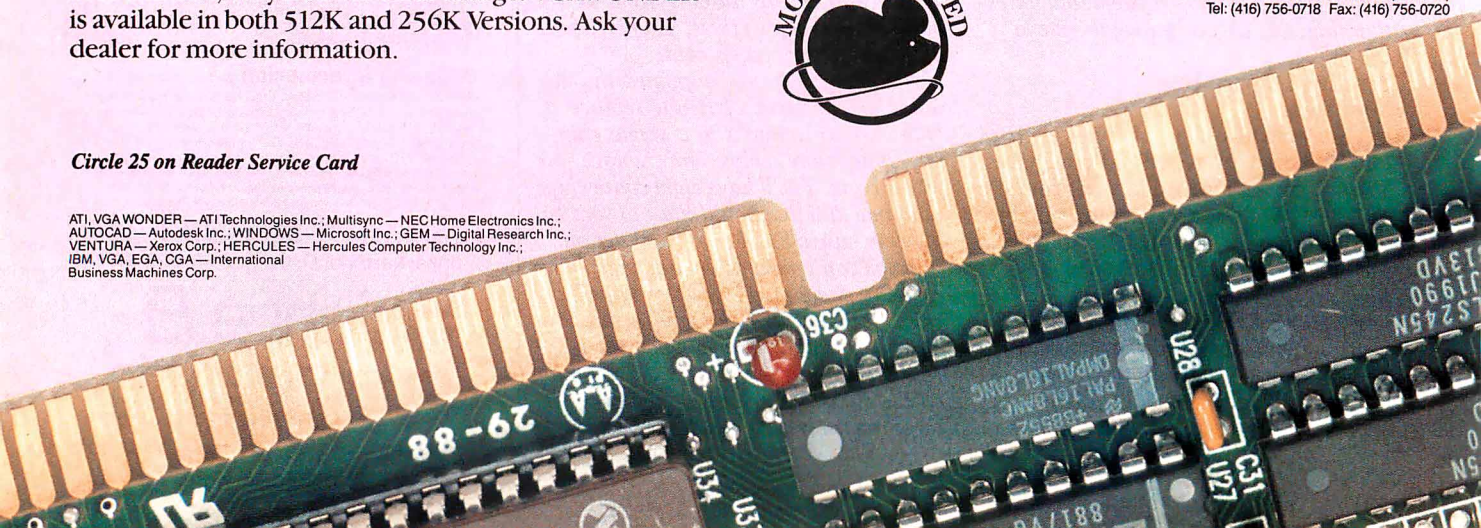
Technology you can Trust.

ATI Technologies Inc.
3761 Victoria Park Ave., Scarborough, Ontario
Canada M1W 3S2 Telex: 06-966640 (ATI TOR)
Tel: (416) 756-0718 Fax: (416) 756-0720



Circle 25 on Reader Service Card

ATI, VGA WONDER — ATI Technologies Inc.; Multisync — NEC Home Electronics Inc.;
AUTOCAD — Autodesk Inc.; WINDOWS — Microsoft Inc.; GEM — Digital Research Inc.;
VENTURA — Xerox Corp.; HERCULES — Hercules Computer Technology Inc.;
IBM, VGA, EGA, CGA — International Business Machines Corp.



BOOK REVIEWS

The Science of Fractal Images

Edited by
Heinz-Otto Peitgen
and Deitmar Saupe

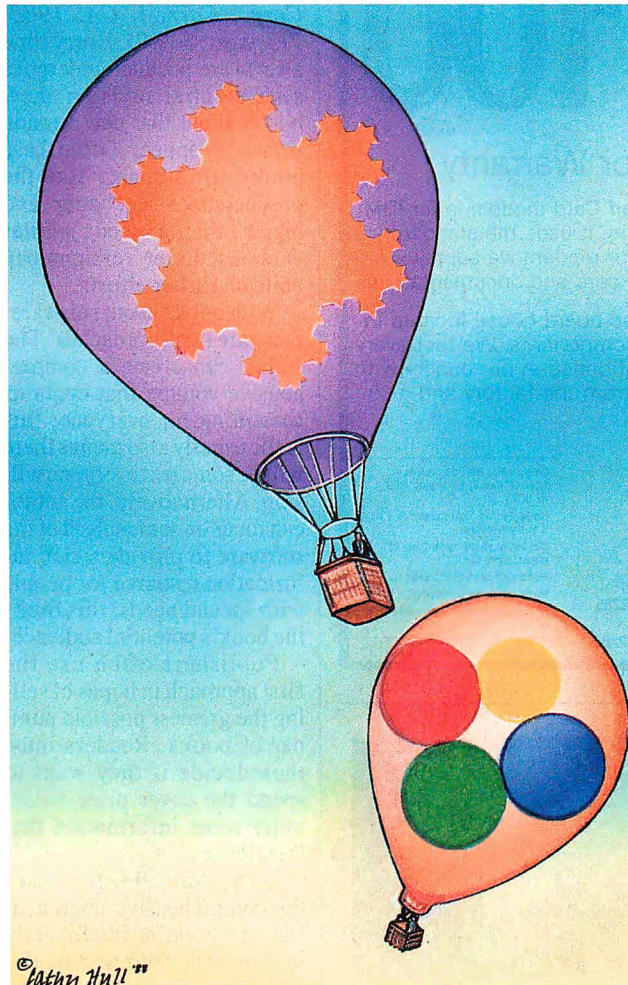
Springer-Verlag, New York:
1988, 312 pages, \$34

Reviewed by Eric Bobinsky

Fractals are undeniably becoming an important part of our high-tech world, quickly gaining ground in areas as diverse as pattern recognition, plasma physics, data compression, and cell physiology, as well as in their established place in computer graphics. The professional programmers, engineers, scientists, and educators who will be expected to deal with them must learn what they are and how to use them. Fortunately, the last 2 years have seen the publication of several excellent books on fractals. The latest and perhaps most distinguished addition to this collection is Springer-Verlag's *The Science of Fractal Images*, edited by Heinz-Otto Peitgen and Deitmar Saupe.

Based on the notes of a very good intensive short course presented at SIGGRAPH '87, *Fractal Images* is written by six authors whose names constitute a Who's Who of some of the world's top fractal researchers.

Following an amusing foreword by Benoit Mandelbrot, the book contains five lengthy and expertly presented chapters on producing fractal imagery: "Fractals in Nature: From Characterization to Simulation" by Richard Voss, "Algorithms for Random Fractals" by Dietmar Saupe, "Fractal Patterns Arising in Chaotic Dynamical Systems" by Robert Devaney, and "Fractal Modelling of Real



World Images" by Michael Barnsley. Three appendixes cover additional details, and a fourth, written by photographer Michael McGuire, is an intriguing look at the aesthet-

ics of fractal imagery, with the added pleasant surprise of nine photographs by Ansel Adams.

As was true with Peitgen's earlier book, *The Beauty of*

Fractals (for a review, see the May 1987 BYTE), this work contains a wealth of beautifully reproduced color plates and numerous black-and-white images.

The book contains many pseudocoded algorithms and is aimed at the professional who intends to produce and use fractal images in his or her work. The level of mathematical sophistication is fairly high, and it would not be unreasonable to assume that the reader has some knowledge of digital signal processing (or at least basic Fourier transforms and spectral analysis), basic probability theory and some statistical mechanics, affine transformations, and perhaps basic theory of dynamical systems, with a little real or complex analysis thrown in for good measure.

This book is not for the mathematically faint of heart, but it will be accessible to most college graduates with a science or engineering degree of some kind. In addition, the text is so clearly written and so easy to follow that even readers without knowledge of a particular specialty should be able to follow the arguments by their context alone.

The Science of Fractal Images will no doubt be used as a textbook, a programming sourcebook, and, perhaps, a coffee-table conversation piece, but it will also prove invaluable in helping guide a generation of researchers in many diverse fields into a new and provocative area of the imagination. Fractal geometry may become as fundamental a tool as calculus, which made it possible for us to reach the planets. As Mandelbrot exhorts in his foreword, "Let us all pay to the book the high compliment of promptly making it quite obsolete."

continued

ALSO REVIEWED

Using QuickBASIC 4

Unix Programming: Methods and Tools

A Few Good Men from Univac

The Electronic Sweatshop

Mind, Language, Machine: Artificial Intelligence in the Poststructuralist Age

Artificial Intelligence and Human Learning

Quality Was Never Priced So Low!

2400 bps
2400 / 1200 / 300 bps
MODEM

ONLY

\$100

MADE IN U.S.A.

5 Year Parts and Labor Warranty

Our **2400HC²** Hayes Compatible Half Card modem is for IBM PC/XT/AT and compatible computers. It uses the standard 'AT' command set. Included with our modem we supply communications software, a 7 foot cord and documentation.

We build our modems at a mil-spec board house located in suburban Chicago, using quality components. We test every modem shipped and back our confidence in our quality with a 5 year parts and labor warranty from the factory and a 30 day money back guarantee.

Kiss

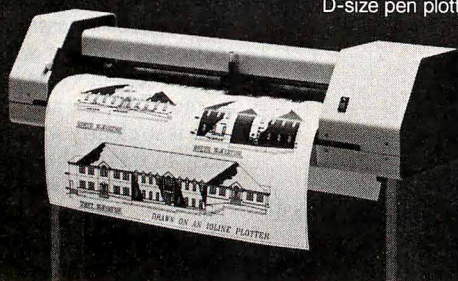
Engineering Inc.

162 N. Franklin St. • 5th Floor • Chicago, IL 60606
Toll Free Order Line for orders only 1-800-442-2285
For orders in Illinois 1-312-358-1501
Kiss Engineering Technical Support 1-800-442-2285

Orders within the USA (including Alaska & Hawaii) are shipped FREE via UPS.
Payment in U.S. funds drawn on a U.S. bank required.
COD orders placed before 2 pm CST shipped same day.
Illinois residents add 8% sales tax.
We do not accept credit cards.
Please send check or money order for \$100.

INTRODUCING

Ioline LP3500
D-size pen plotter



The New Standard in Ease of Use

- Value priced at \$3,195
- One-year, no-cost warranty
- Professional plot quality
- Revolutionary plot utility eliminates learning curve
- Supports HP-GL and DM/PL
- Plot sizes from 23"×81" to 1.5"×1.5"
- Optional oak stand available

IOLINE™
CORPORATION

Call (206) 821-2140 or write for more information

12020 - 113th AVE. N.E., KIRKLAND, WA 98034

BOOK REVIEWS

BRIEFLY NOTED

Using QuickBASIC 4 by Phil Feldman and Tom Rugg, *Que Corp.*, Carmel, CA: 1988, 713 pages, \$19.95. Every time a software product undergoes a substantial revision, new books about that new version invariably appear. Often these books—presumably like the product itself—get better, and bigger, than previous similar versions. Later versions can build on earlier efforts.

With books about software, there are two approaches. The author can create a comprehensive volume that contains something for everyone; this tactic usually also means there will be some text everyone will skip. Alternatively, the author can focus on some subset of the software to provide a rich information resource for people with special needs; this limits the book's potential audience.

Publishers often use the first approach in hopes of selling the greatest possible number of books. Readers must then decide if they want to spend the cover price to acquire some information that they'll use.

Using QuickBASIC 4 uses the comprehensive approach. But the book is intelligently broken into four segments, each of which might be useful to different groups of readers. The segments cover the fundamentals of the software, such as loading and running the QuickBASIC environment; introductory programming; advanced programming; and a 101-page QuickBASIC reference.

The first section provides a rich overview of QuickBASIC, including some excellent material on the differences between BASICA/GWBASIC and QuickBASIC. This material makes the section valuable for the person making the switch from the old to the new version of Microsoft BASIC. The section also provides a chapter called "Up and Running in Ten Minutes," which will help the person familiar with his or her machine and general

BASIC programming principles get started quickly.

The second section covers programming fundamentals, including an excellent treatment of handling disk files. When I first learned BASIC, disk I/O routines were the hardest part of the language to understand. But this book's explanations, along with simple but useful sample code, illustrates the key principles nicely.

The Advanced Programming section deals with functions, subprograms, and QuickBASIC modules. It also has a good chapter on memory management and some excellent material on invoking MS-DOS and ROM BIOS interrupts from your QuickBASIC programs.

As an experienced QuickBASIC programmer, I found the last two sections of this book very useful. For a newcomer to QuickBASIC, this book would suffice both to get you started and as a reference for many months to come.

—G. Michael Vose

Unix Programming: Methods and Tools by James F. Peters III, *Harcourt Brace Jovanovich*, New York: 1988, 447 pages, \$25. James Peters, a Ph.D. computer science student at Kansas State University, is the author of a book designed specifically as a thorough and elementary presentation of the use of Unix System V. The beauty of *Unix Programming: Methods and Tools* is in its pedagogy. Each chapter begins with amusing and relevant quotations from computer scientists and a series of "aims" clarifying the topics covered. At the end of each chapter is a summary, a review quiz, and a reading list.

Peters sprinkles numerous examples throughout the book, and all of them have been tested under generic Unix System V and Xenix. Rather than treating many Unix topics superficially, Peters focuses on the Bourne

continued

I N T R O D U C I N G

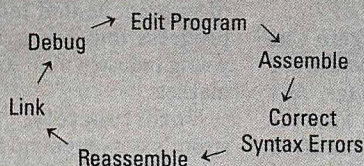


THE INCREMENTAL ASSEMBLER DEVELOPMENT ENVIRONMENT

a Revolution in Assembler Programming

A complete, integrated macro assembler development environment for the 8086 family of processors under DOS. Including a powerful window-oriented source debugger, syntax checking editor, fast linker, and the FIRST INCREMENTAL ASSEMBLER.

Other assembler development cycles look like this:



Cycle Time: 2-20 minutes (or more)

The INCRA development cycle looks like this:

Edit ↔ Debug

Cycle Time: Less than 1 Second!

With other systems, the development cycle for large programs can take several minutes involving a lot of tedious hopping from one program to another. The INCRA Assembly development environment is completely integrated, everything you need to develop assembler programs or routines for programs in other languages, is available at the touch of a key. With INCRA you go from program entry and editing to debugging instantly because the INCRA assembler is INCREMENTAL. It updates the executable code as soon as you change the source – in milliseconds. And the powerful INCRA debug window is always available at the push of a key to trace through the program. If you find a mistake, just flip to the editor and correct it, then flip to the debugger and continue testing.

The INCRA editor checks your assembler syntax as you enter, giving intelligent error messages that make it clear what was wrong and how to fix it – you never have to worry about waiting 5 minutes for a program to assemble, only to find you have to do it all over because you forgot to put in a comma! INCRA

also contains a fast, integrated linker that can quickly pull in procedures from other modules and libraries at the push of a button. The INCRA incremental assembler works just as well on linked programs as on single modules, so you can develop large, multi-module programs, and mixed language programs with ease. And with INCRA, macros expand as soon as you enter them, no need to wait for assembly to see if the macro expanded the way you thought it would! If there's a mistake, just edit the macro call, and the macro will immediately reflect the changes.

If you're a serious programmer working with assembler, INCRA's power and speed will make your life easier. If you're just learning assembler, INCRA's ease of use will make it exciting and fun!

If you've always thought of assembler programming as slow, time-consuming, complicated and tedious, wait till you get your hands on INCRA. You'll be saying assembler development with INCRA is Fast... Efficient... FUN!

\$180⁰⁰ u.s.

*If you do any assembler programming at all...
Incra is the tool to use.*

SYSTEM REQUIREMENTS: IBM® PC OR COMPATIBLE WITH 256K

Incra Features:

Incremental Assembler

- ☆ Complete macro assembler
- ☆ Supports 8086/88, 80186, 80286, 8087, 80287
- ☆ Also operates in batch mode (faster than MASM 5.0)
- ☆ Compatible with MASM 5.0 (will assemble most MASM 5.0 programs without changes)

Editor

- ☆ Full Screen, fully featured
- ☆ Syntax checking
- ☆ Automatic INCREMENTAL assembly
- ☆ Customizable Options
- ☆ Unique line buffer for moving and re-ordering lines
- ☆ Super fast search and page
- ☆ Instantly generates .exe and .obj files
- ☆ Template program files
- ☆ Lots more!

Debugger

- ☆ Window-oriented – see all data, registers, flags, and executing source lines (with comments) at a glance
- ☆ Fully symbolic (no need to declare publics)
- ☆ Single step, multiple breakpoints, conditional breakpoints, check-trace
- ☆ Highlights changes to registers, flags & data at each step
- ☆ Powerful symbolic data display options
- ☆ Save and restore data display definitions
- ☆ Dissassemble with symbolic names
- ☆ Flip to and from your program's display screen
- ☆ Lots more!

Linker

- ☆ Faster than MASM 5.0
- ☆ Link incra files, regular .obj files, and libraries

Macros

- ☆ Full macro capabilities
- ☆ Macros can be instantly expanded in the editor to inspect resulting source
- ☆ Full conditional assembly is supported

Calculator

- ☆ Available at all times
- ☆ Complete set of arithmetic and logical operations
- ☆ All program constant and offset values are available as operands
- ☆ Hex, decimal, octal, binary, ascii results and operands accepted

Options

- ☆ Change environment features such as screen colors, cursor type, tabs, processor type, etc.
- ☆ Save options permanently

Help

- ☆ Pop-up command descriptions available at all times

To order: Call (U.S.A. or Canada)

1-800-263-5645

or send check or money order to:

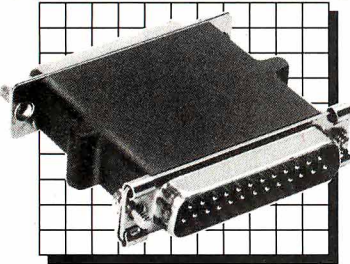
daystar
COMPUTING

25 Warrender Ave., Suite 909
Islington, Ontario Canada
M9B 5Z4

(dealer inquiries welcome)

1-416-234-9347

PROTECT INTELLIGENCE WITH INTELLIGENCE



SOFTWARE PROTECTION KEYS BY PROTECH

PROTECH KEYS:

- ☐ are totally transparent to the end user
- ☐ allow unlimited back up copies
- ☐ free up disk drives
- ☐ do not interfere with peripheral operations
- ☐ are easy to install
- ☐ protect software developers' revenues
- ☐ assembler based routines (not drivers)
- ☐ encrypted routines
- ☐ physically unique hardware KEYS
- ☐ sophisticated software installation advice
- ☐ provide the highest level of protection available

THE KEY

The KEY provides effective software protection while insuring customer satisfaction. The KEY is a random response device which is designed for identically reproduced software packages.

THE MEMORY KEY

The MEMORY KEY is a programmable software protection device. Each byte of memory can be addressed in groups or individually. Possible applications for the MEMORY KEY include:

- ☐ modular package control
- ☐ serialization
- ☐ customization
- ☐ access control to PCs
- ☐ demo control
- ☐ software leasing
- ☐ updating modules in the field
- ☐ any "counter" operation

For a demonstration package or additional information, please write or call:

1-800-843-0413

PROTECH MARKETING, INC.
1804 W. Southern Parkway • Bldg. A-112
Durham, North Carolina 27707
(919) 490-4970 FAX (919) 490-4974

WE HAVE THE KEY TO SOFTWARE COPY PROTECTION

BOOK REVIEWS

shell, the C shell, sed, and awk. He also presents common user commands and the two most common Unix editors, ed and vi.

Unix Programming is one of the few books I have seen that would be an excellent self-teaching guide for beginners. Access to a computer running Unix System V is almost essential, even though the book goes further than most in showing and explaining output. It does not, as the title might lead you to expect, teach anything about programming in C. Programs are written in the shell command language and awk. It is an excellent introduction to the methods and tools of Unix. —Jason Levitt

A Few Good Men from Univac by David E. Lundstrom, MIT Press, Cambridge, MA: 1987, 227 pages, \$19.95. Author David E. Lundstrom recalls a time when the physical impressiveness of computers matched their electronic sophistication.

The title of this book is misleading, for it is not really about the early Univac computers: It begins after the Univac I and only briefly describes the construction of the Univac II. Lundstrom concentrates primarily on the formation and rise of Control Data Corp. out of the Univac division of Sperry Rand. He writes from first-hand knowledge, having worked for CDC for many years.

The early chapters are rich with interesting anecdotes about early computers: central processing units with "hallways" inside for access by engineers, massive disk drives whose spinning platters created eerie winds in the computer room, and the early exploits of Seymour Cray, CDC's hotshot designer who eventually left to form Cray Research and build supercomputers. We get a fascinating portrait of life in the Stone Age of the computer era, when each computer cost millions of dollars and Minneapolis/St. Paul (home to both Univac and

CDC) was the Silicon Valley of the Midwest.

The strongest section in *A Few Good Men* is Lundstrom's description of a computerized radar-tracking system developed by Univac for the Navy. The Naval Tactical Data System (NTDS) seems to be an early predecessor of the controversial AEGIS system, and it is notable for its innovation and sophistication.

The late 1950s were exciting times; large computers were being transistorized and coming into their own, and new applications like the NTDS were arising every day. What the early 1980s were to personal computers, this era was to mainframes: a period of unprecedented technical progress that was driving a young industry into exploding markets.

Unfortunately, Lundstrom's story seems to follow a course similar to that of CDC. It progresses from the compact and technically interesting world of computer design to the slow and bureaucratic realm of corporate planning and politics.

The latter half of the book portrays mostly minor developments in peripheral technology and loses its technical interest, largely, I think, due to Lundstrom's career change from engineering to marketing. The final chapters concern mostly salespeople and their stories, even recounting in detail CDC employees' vacations in Acapulco.

In a sense, the shift in focus of the book is appropriate, if a little disappointing, since it illustrates the evolution of a typical computer company from an exciting technical start-up to a clumsy technocracy. Apple, take note!

—David A. Mindell

The Electronic Sweatshop by Barbara Garson, Simon and Schuster, New York: 1988, 288 pages, \$17.95. Electronic automation has been hailed as a means to achieve increased efficiency and higher quality,

continued

**hp HEWLETT
PACKARD**

Authorized Dealer

Top Quality HP!

NOW In Stock!

Hewlett-Packard
Supplies



**CAD Plotters from
Hewlett-Packard**

- Fast Service
- Fast Delivery
- Low Prices
- Corporate Accounts Welcomed



Impact Computer Systems, Inc.
Glen Wild Rd. Glen Wild, NY 12738

Call Now 1-800-431-3400

In N.Y. State 914-434-3338

INTRODUCTORY PRICE

\$99.95

Regular price \$149.95.

WALTER BRIGHT — Programmer

"This is a revolutionary product which reflects the fact that Walter Bright is one of the world's best programmers."

Andy Redfern, Personal Computer World

"I find it amazing that Walter continues to find ways to improve his already excellent product."

Scott Robert Ladd, Micro Cornucopia



FROM ZORTECH INC.

C is great!

C++ is better!!

Performance benchmarks

Benchmark	Zortech C	Zortech C++	Turbo C 1.5	Quick C 1.0
Sieve	20.49	20.54	23.62	22.72
Rsieve	20.49	20.54	23.62	22.03
Integer	1.32	1.38	6.31	6.49
Float	0.17	0.22	52.29	51.03
*Float	32.73	37.74	52.39	51.63
Pointer	17.91	17.96	17.13	16.87
Rpointer	17.79	17.91	17.14	16.64
Loop	3.90	3.90	3.90	3.90
Optimize	0.49	0.60	8.46	8.79

Benchmarks were run on an 80286 based IBM compatible at 6Mhz with no 8087.

*The float benchmark was re-run without optimization.

Zortech C++ is the first native-code C++ compiler for MS-DOS compatible machines. This means you don't need to spend a lot of money on a C compiler. In fact, Zortech C++ comes with a C++ compiler, a C compiler, a linker, a librarian, a fully integrated editing environment, context sensitive help and the fastest graphics library you've ever seen!

With Zortech C++, you can mix and match code in C++, C and assembler and link them all together with a single command!

Zortech C++ comes with a complete C++ and C library, including compatibility with the ANSI C draft. Unique to Zortech C++ is support for mice, fast screen writes, re-entrant floating point and speaker support.

Now you can move your Microsoft and Turbo C code over to Zortech C++ — we've included compatible library functions!

Also, we have made Zortech C++ compatible with Microsoft's Codeview debugger!

Enter the world of Object Oriented Programming (oops) with Zortech C++!

Sure, C is great — but C++ is better!

NOW AVAILABLE...

Std. Library Source Code

Only \$49.95 * (with C++ Purchase)

YES!

Rush me:

☐ Zortech C++
99.95*

☐ Library Source
\$49.95*

☐ Intro to OOP and C++
\$27.95*

☐ The C++ Programming Language
\$29.95

VISA/MC/COD CHECK ACCEPTED

Name.....

Address.....

Phone.....

VISA or MC#..... Exp. date.....

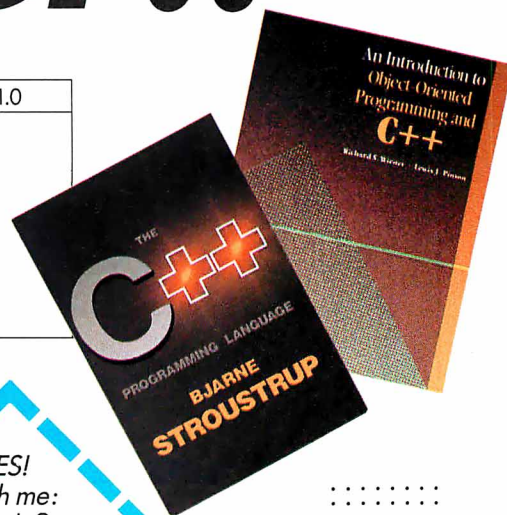
B12

To: ZORTECH INC. 366 Massachusetts Ave., Arlington, MA 02174. Tel: 617-646-6703. Fax: 617-643-7969.

CALL THE ORDER HOTLINE 1-800-848-8408

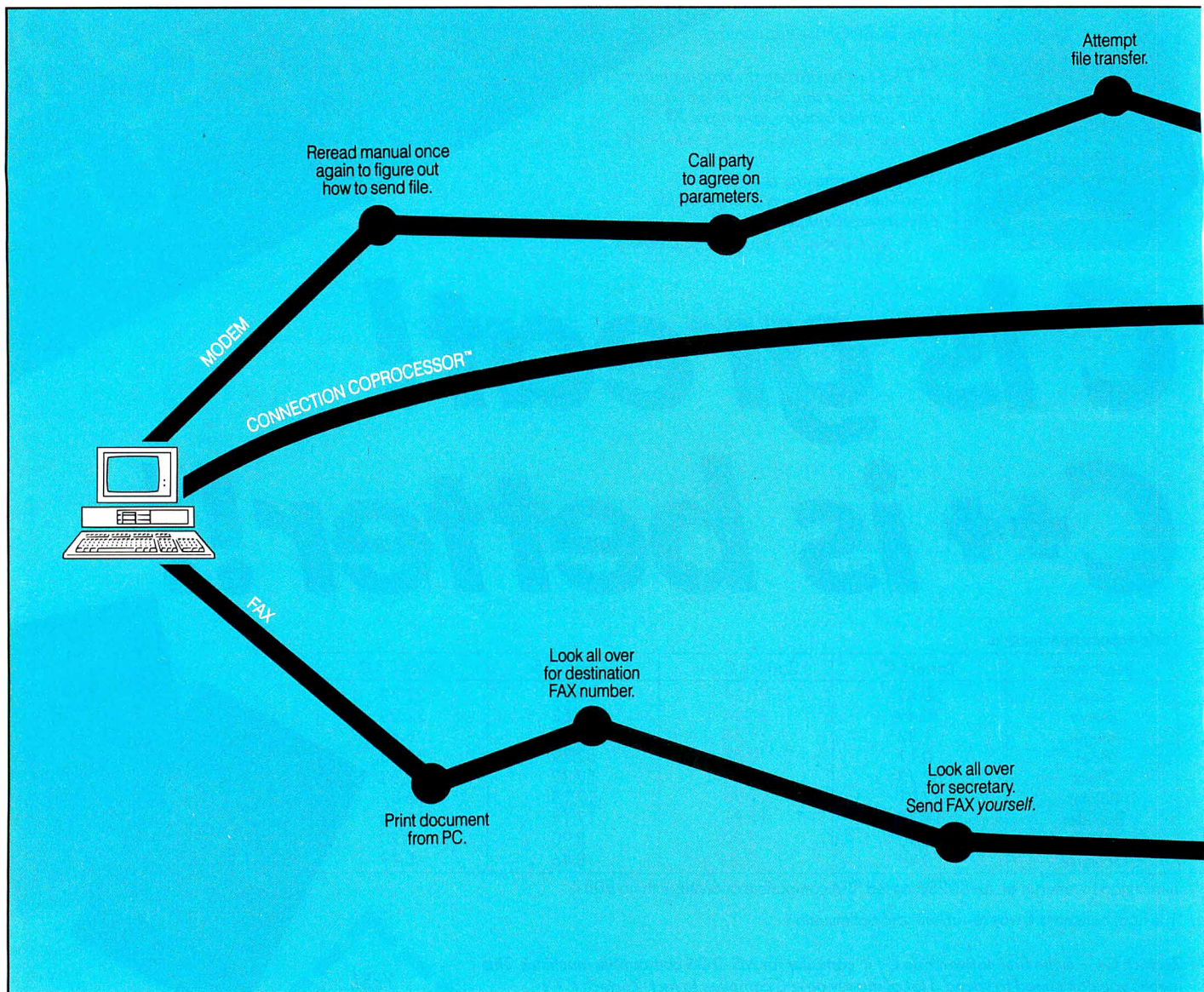
Come by and see us at OOPSLA '88!

* Please add \$5.05 shipping to your order (UPS Ground)



ZORTECH

Intel announces



Announcing the first non-stop communications route between businesses anywhere in the world.

Intel's Connection CoProcessor™

It's a whole new way to send and receive programs, files, text, graphics and electronic messages. Not just between PCs, but with fax machines as well.

The Intel Connection is a new communications coprocessing board that frees your PC from the task of communicating.

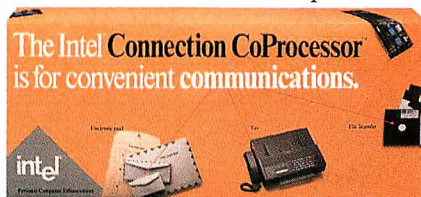
Which means you can work on your computer non-stop—even while

sending a document as big as the New York phone book.

Now your faxes or files can fly cross country. And you can still be zooming around in your flight simulator. Or writing that letter to your biggest account. Or recalculating your spreadsheets for tomorrow's meeting. Without interruption or downtime.

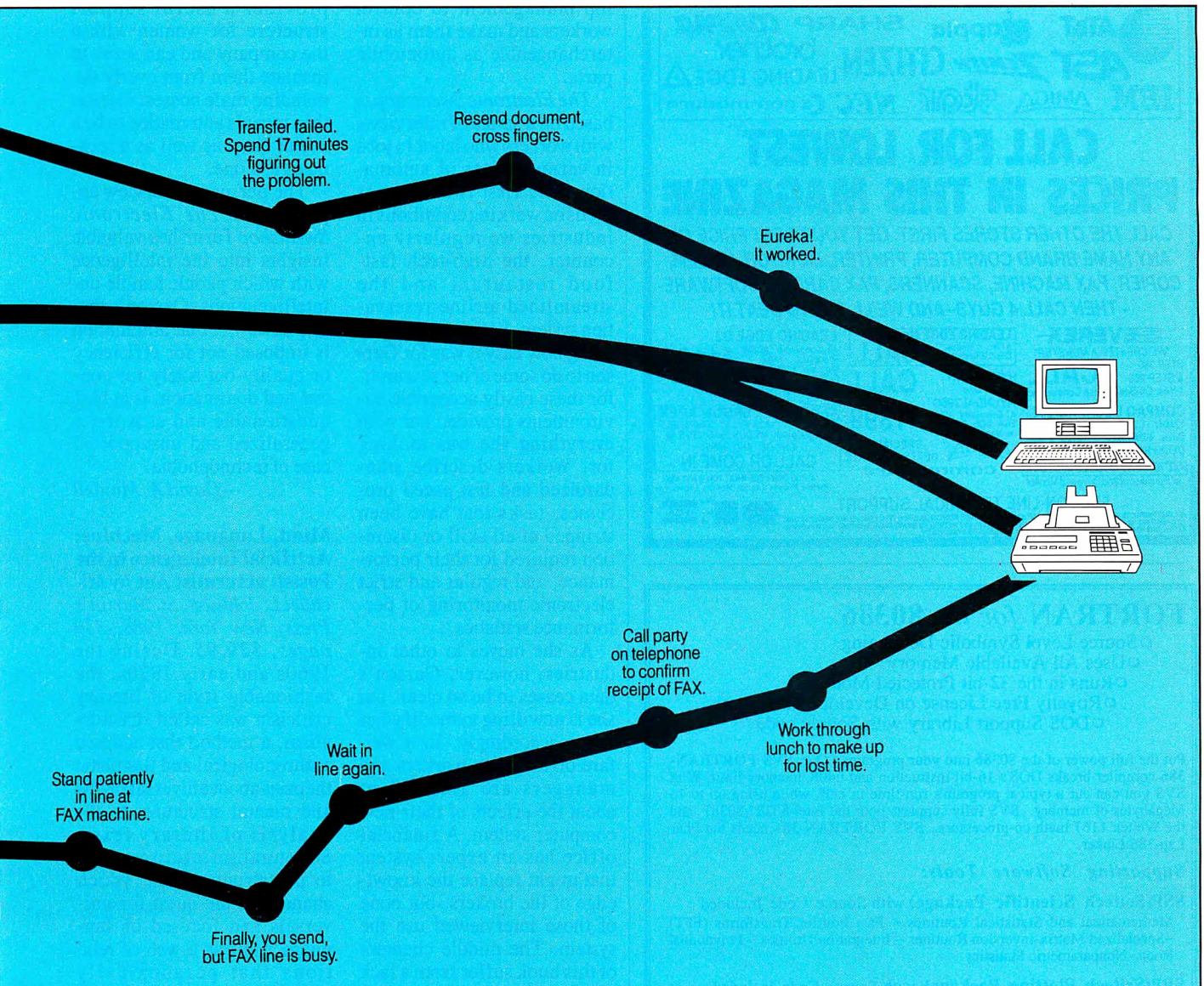
And when you fax, there are no more stopovers at the printer, or cooling your heels in line at the fax machine. Because Connection lets you do everything without leaving your PC.

And when you send files directly to



©1988 Intel Corporation. Connection CoProcessor is a trademark of Intel Corporation. WordPerfect is a registered trademark of WordPerfect Corp. Symantec is a trademark of Symantec Corp. Borland is a registered trademark of Borland trademark of Microsoft Corporation. *CAS (DCA/Intel Communicating Application Specification.)

non-stop flights.



another Connection-equipped PC, you won't have to fiddle around with modem parameters or protocols. Because the Connection CoProcessor sets them for you. At 9600 bps.

Best of all, Connection supports CAS,* a new communication standard that is supported by major software and hardware developers like Symantec,[™] Borland,[®] DCA,[®] Microsoft,[®] and WordPerfect.[®] Which means you can send, for example, a word processing file to your London office, without ever exiting your WordPerfect program.

You just send the document directly from your application. That's it. There isn't any complicated

communications software to learn.

And everything is backed by toll-free technical support and a five-year warranty from Intel.

So what are you waiting for? Call 800-538-3373 now for a free demo disk.

Because with Intel's Connection CoProcessor, communication is really going to take off.

intel[®]

Corporation. DCA is a registered trademark of Digital Communications Associates, Inc. Microsoft is a registered

"INVADING THE COMPUTER WORLD"

4 GUYS Computers

IN NYS (212) 643-3900 ON SAT (212) 239-4350

PHONE ORDERS ACCEPTED **1-800-242-4GUY**

AT&T Apple SHARP COMPAQ
AST ZENITH CITIZEN brother
IBM AMIGA STEAR NEC Commodore

CALL FOR LOWEST PRICES IN THIS MAGAZINE

CALL THE OTHER STORES FIRST, GET YOUR BEST PRICE ON ANY NAME BRAND COMPUTER, PRINTER, MONITOR, MODEM, COPIER, FAX MACHINE, SCANNERS, FAX CARD OR SOFTWARE - THEN CALL 4 GUYS--AND WE'LL TRY TO BEAT IT!

EVEREX "WE CREATED A MONSTER"
STEP 386 & STEP 286
1 Year On-Site Service Contract Incl.
CALL

LEADING EDGE Model D
640K 1 Drive
HYUNDAI XT
640K 1 Drive
HYUNDAI 286C
AT Compatible 10MHz
EGA DOS 30MB H.D.
w/ Monitor Purchase
CALL

LEADING EDGE D2
AT Compatible 80286
Processor 640K
Memory 1.2MB Floppy
DOS 3.2 & GW Basic AT 101 Keyboard
Leading Edge Word Processor Incl.
\$1199

COMPAQ DESKPRO 286
12MHz 1.2 Floppy
Drive 40MB H.D.
DESKPRO 386.2.5...**CALL**

AMIGA SPECIAL DEALS & REBATE
commodore CQLT

ALL AMISHAD MODELS IN STOCK
w/ Purchase of 2nd Drive and Monitor

FULL ON-LINE TECHNICAL SUPPORT

ALL OUR PRODUCTS ARE FACTORY FRESH WITH FULL WARRANTY. NOT RESPONSIBLE FOR TYPE ERRORS. ALL PRICES IN THIS ADVERTISING ONLY. 10 DAY RETURN WITH ALL ORIGINAL PACKAGING AND RETURN AUTHORIZATION. SHIPPING AND HANDLING EXTRA. THIS ADVERTISING SUPERSEDES ALL OTHER ADVERTISING. PRICES SUBJECT TO AVAILABILITY.

but Barbara Garson has a different opinion. In her book, Garson suggests that computerization of the workplace is the effort of a mean-spirited top management to control workers and make them as interchangeable as automobile parts.

The Electronic Sweatshop is based on a series of interviews with workers who labor in jobs in various states of automation. The first two chapters focus on working conditions in industries we regularly encounter: the high-tech fast-food restaurant and the streamlined airline reservation system. It is almost frightening how easy it was for Garson to do some of her research, for these easily accessible environments provided her with everything she was looking for. Workers describe standardized and fast-paced processes, tasks that have been

other hand, newly created "administrative services" organizations are large, powerful, and composed primarily of women. This development provides a useful support structure for women within the company and can serve to insulate them from overly demanding male bosses. Garson thus reveals automation to be a social issue as well as a technological one.

The personal-interview approach of *The Electronic Sweatshop* furnishes valuable insights into the intelligence with which people handle unintelligent jobs. Garson's thesis, however, that automation is imposed not for efficiency or quality but solely for control and domination, is at best questionable and at worst a generalized and unsupported case of technophobia.

—David A. Mindell

Mind, Language, Machine: Artificial Intelligence in the Poststructuralist Age by Michael L. Johnson, St. Martin's Press, New York: 1988, 339 pages, \$29.95. During the 1960s and early 1970s, the fashionable style of literary criticism was called structuralism, a method that adapted anthropological and linguistic theories about universal myths and mental structures to the analysis of literary texts. Structuralism in turn gave way to poststructuralism, which abandoned the quest for universals and focused on language itself as a web of relations that paradoxically describes and constitutes reality.

In this book, English professor Michael L. Johnson reviews the field of artificial intelligence from the poststructuralist perspective. He discerns a grand convergence between the two fields, like the convergence between physics and mysticism outlined by Fritjof Capra in *The Tao of Physics*.

Johnson pitches his writing to an academic audience that presumably can digest sen-

stripped of all skill or discretion required for their performance, and regular and strict electronic monitoring of performance statistics.

As she moves to other industries, however, Garson's data ceases to be so clear, but she is unwilling to modify her thesis accordingly. In a welfare office, both workers and managers are ambivalent about the effects of their new computer system. A financial office has an expert system that might replace the knowledge of the brokers, but none of those interviewed use the system. The middle chapters of this book suffer from a lack of coherence, leaving the reader with a disconnected series of anecdotes.

The book's strongest chapter is on a large corporate automation project designed to break the "monogamous" relationships between bosses and secretaries. The questions thus raised are the source of Garson's best insights, for she recasts automation as a feminist issue. On one hand, computers are able to turn a highly skilled and multitalented secretary into a dronelike "information processor." On the

FORTTRAN for the 80386

- Source Level Symbolic Debugging
- Uses All Available Memory
- Runs in the 32-bit Protected Mode
- Royalty Free License on Developed Programs
- DOS Support Library with Source code

Put the full power of the 80386 into your programs. Our SVS FORTTRAN-386 compiler breaks DOS's 16-bit instruction and 640K memory limit. With SVS you can cut a typical program's run-time in half, while using up to 16 Megabytes of memory. SVS fully supports both the Intel 80287/80387 and the Weitek 1167 math co-processors. SVS FORTTRAN-386 needs the Phar Lap-386 Linker.

Supporting Software Tools:

SSP(Scitech Scientific Package) with Source Code Included
Mathematical and Statistical Routines ~ Fast Fourier Transforms (FFT)
~Specialized Matrix-Inversion Routines ~ Integration Utilities ~ Polynomial Roots~Nonparametric Statistics

SPP(Scitech Plotting Package) with Source Code Included
Supports CGA, EGA, MCGA, VGA, Hercules and AT&T 6300 graphic displays. Plots can be created and displayed or saved in a disk file with provision for enlarging, reducing, translating and rotating the original plot.

MAT(Maintainability Analysis Tool)

MAT analyzes and diagnoses your FORTTRAN programs, documents each module's interface, including all intercommunicating modules and generates cross-reference tables. MAT provides the information you need to make your programs more reliable and easier to maintain.

Prices:

SVS FORTTRAN-386.....	\$695
SVS PASCAL-386.....	\$695
Phar Lap-386 ASM/LINK.....	\$495
Scitech Scientific Package.....	\$325
Scitech Plotting Package.....	\$325
Maintainability Analysis Tool.....	\$595

For more information call:
1-800-346-5159
In CA call (415) 960-5931

SAIC
Science Applications
International Corporation

5150 El Camino Real, Suite C-31
Los Altos, California 94022

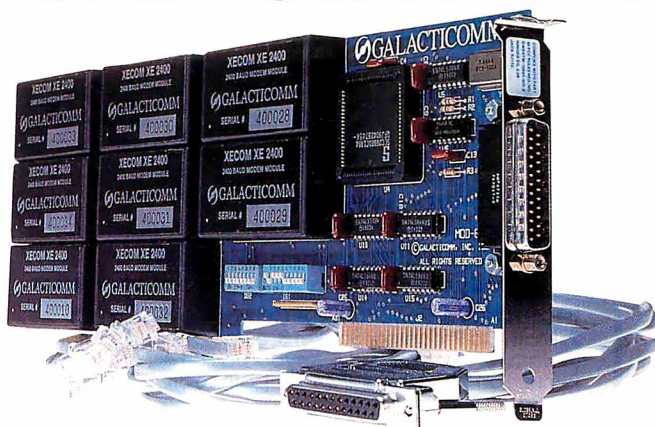
How To Support Your Customers

You can provide software updates, answer technical questions, and offer reams of product information to anyone with a modem. 24 hours a day, 7 days a week, **unattended.**

All you need is a PC, XT, AT, or 386-compatible, and a Galacticom multi-user hardware/software package. And some phone lines.

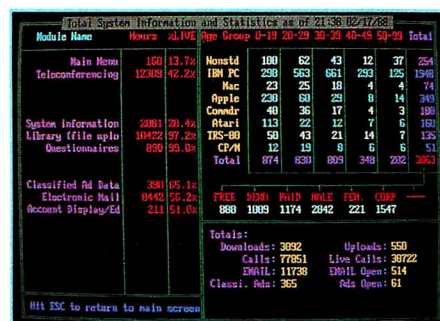
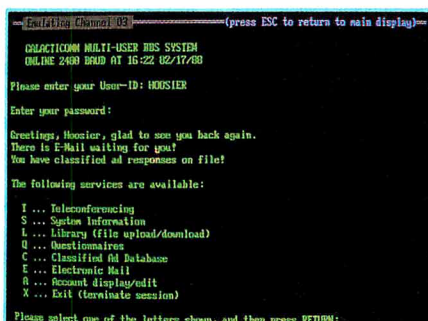
Our multi-user Bulletin Board System software, called **The Major BBS™**, supports your customers in several ways:

- Public Posting Areas technical dialogue, bulletins, Q&A listings
- Private E-Mail for one-on-one customer support
- Teleconferencing online "seminars" and real-time interaction
- File Upload/Download distribute updates, P.R. info, "app notes"
- Questionnaires for market research, order forms, etc.



Our multi-modem PC cards are available in several configurations: 2 to 8 modems per card at 2400 baud, or 2 to 16 modems per card at 1200 baud. These are true single-slot cards with the modems built right in — no additional serial ports, power supplies, or external boxes of any kind are required.

The Major BBS can support **up to 64 users** simultaneously, although most of our customers operate small 4- to 16-user systems. The C source code is also available, so that you can modify the system to suit your specific requirements.



For \$59, we'll send you an introductory copy of *The Major BBS*, suitable for use with your standard COM1 and/or COM2 modems. This is a fully functional version for up to 2 simultaneous users (3 if you count the SysOp). You can upgrade later to a fully supported 4, 8, 16, 32, or 64-user version for only \$300 per doubling (plus modem hardware of course!).

Yes! Send me a copy of
THE MAJOR BBS!

Name _____
Company _____
Address _____
City _____ State _____ Zip _____

(Florida orders add \$3.54 tax. Overseas orders add U.S. \$25 for shipping.)

☐ \$59.00 check enclosed
☐ \$67.30 for C.O.D.
☐ \$65.15 for credit card:
☐ VISA ☐ MC ☐ AMEX _____ /
Exp. Date _____
Signature _____

GALACTICOMM

Galacticomm, Inc. 4101 S.W. 47 Ave.
Suite 101, Fort Lauderdale, FL 33314

Circle 112 on Reader Service Card

Modem: (305) 583-7808
Fax: (305) 583-7846
Voice: (305) 583-5990

DECEMBER 1988 • B Y T E 59

IBM PC® COMPATIBLE SINGLE BOARD COMPUTER

Quark/PC®+

4" x 6"



From
\$325.
quantity one

- Low Power — Less than 3 Watts
- Optional on-board Video LCD Driver
- Ideal for any PC compatible OEM product which is not a personal computer

Includes: 1. Powerful V40® CPU (Faster than a PC)
2. Math Co-Processor Socket 3. 5 Volt Only Operation (3 watts) 4. Speaker Port 5. Keyboard Port 6. Parallel Printer Port 7. PC Bus 8. PC Compatible BIOS ROM 9. 1 Serial Port

On board Options Include: 1. 5 Mode Video Controller Option (Monochrome, Hercules® Graphics, CGA, High Res CGA, LCD Driver) 2. Floppy Disk Controller (3.5"/5.25", 360K/720K/1.2 MB) 3. SCSI Bus Interface (Hard Disk etc.) 4. Up to 768K RAM 5. Battery-Backed-up Real-Time-Clock 6. 2 Additional RS232C Serial Ports

To order or enquire call us today.
Megatel Computer Corporation
(416) 745-7214 FAX (416) 745-8792

174 Turbine Drive, Weston, Ontario M9L 2S2
U.S. Address: 1051 Clinton St., Buffalo, N.Y. 14206

Distributors:

Germany: V&C Computers (06071) 25666 FAX (06071) 5863
Italy and Southern Europe:

NCS Italia (0331) 256-524 FAX (0331) 256-018

U.K.: Isditron (0959) 76331 FAX (0959) 71017

Australia: Asp Microcomputers (03) 500-0628 FAX (03) 500-9461

Quark is a registered trademark of F&K Manufacturing Company. Hercules is a registered trademark of Hercules Corporation. V40 is a registered trademark of NEC Corp. IBM PC is a registered trademark of IBM Corporation.

megatel

BOOK REVIEWS

tences like the following: "Verbal language takes the (plexiform) form of a spoken or written text, a *textus*, something cybernetically 'woven' of (open) binary events (the processes performed in relation to it) in two dimensions, as it were, continually transmuting (as Walter Porzig has noted) all relationships into spatial relationships..." Along the way, the familiar touchstones of artificial intelligence (AI)—Chomsky's transformational grammar, Weizenbaum's ELIZA program, Winograd's SHRDLU, Schrank's MARGIE, Hofstadter's Strange Loops, and so forth—undergo similar treatment as Johnson weaves them into a discourse that, in the best poststructuralist tradition, tries to undermine itself and succeeds.

The interactions among minds, languages, and computers are mysterious and endlessly fascinating. Does the mind compile language? Is thought like symbolic computation? Can programs execute mental algorithms, and, if so, can they be said to think? Exploring these issues, AI workers have wandered into deep philosophical waters. Language—the central mystery—remains the only vehicle for such explorations. Yet the theorists and modelers to whom Johnson refers manage to construct theories, build systems, and write books describing their results. Readers interested in those theories and systems would be better off consulting the original sources or one of the many excellent overviews that are available. This book sheds obscurity on subjects that already have plenty of that to spare.

—Jon Udell

Artificial Intelligence and Human Learning, edited by John Self, Chapman & Hall, New York: 432 pages, \$42.50. Anyone interested in applying computers to the improvement of instructional methods cannot ignore this book, which contains 24 insightful articles

on the current status of ICAI (Intelligent Computer-Aided Instruction) by American and British researchers. The main topics consist of (1) theoretical issues common to all ICAI research projects, (2) specific tutorial techniques and methodologies, and (3) examples of ICAI application programs.

The book is divided into three corresponding parts. Part 1 includes examinations of such topics as "Representing Complex Knowledge in an Intelligent Machine Tutor" and "Requirements of Conceptual Modelling Systems." The articles are far from being unanimous on the direction of ICAI; for instance, Jim Ridgway argues that current attempts are seriously deficient in both pedagogical and epistemological assumptions.

Part 2 treats specific techniques such as "failure-driven learning," a resolution-based method for discovering students' misconceptions. Important topics in Part 3 include "Design Choices for an Intelligent Arithmetic Tutor," discussion of the Writer's Assistant, ELECTRE Tutor, and the Help system for Unix Mail.

The book ends with an examination of PROUST, which analyzes programs written by novice programmers, and BRIDGE, a complete tutorial environment for beginning programmers.

—Dong H. Kim ■

CONTRIBUTORS

Eric Bobinsky works at the NASA Lewis Research Center in Cleveland, Ohio. **G. Michael Vose** is coeditor of *OS Report: News and Views on OS/2*. He lives in Peterborough, New Hampshire. **Jason Levitt** is a Unix consultant in Austin, Texas. **David A. Mindell** is a writer and computer consultant living in Pittsford, New York. **Jon Udell** is a BYTE technical editor. **Dong H. Kim** is a researcher and consultant in artificial intelligence. He lives in Chapel Hill, NC.

Compact Disk Products, Inc.

CD-ROM/WORM

ALL PRODUCTS, LOWEST PRICES, EXPERT ADVICE

INTRODUCTORY OFFERS

- Hitachi 1500S or 3500S CD-ROM Drive with your choice of:
- NEW Programmer's Reference Library (Microsoft) . . . \$995
 - McGraw Hill Science and Technical Reference Set . . . \$920
 - Grolier Electronic Encyclopedia . . . \$995
 - Microsoft Bookshelf or PC-GIG Library . . . \$895

CD-ROM SOFTWARE

- | | | |
|----------------------------------------------------------|-----|--------|
| Oxford English Dictionary | NEW | \$945 |
| Comstock Stock Photography On CD | NEW | \$445 |
| Educomp Public Domain/Shareware for the Mac | NEW | \$179 |
| The New Grolier Electronic Encyclopedia | | \$359 |
| McGraw Hill or Bookshelf or PC-GIG (Add \$25 for McGraw) | | \$269 |
| The Bible Library | | \$495 |
| Kirk-Othmer Encyclopedia of Chemical Technology | | \$845 |
| Registry of Mass Spectral Data | | \$2655 |
| Geovision U.S. Atlas and Mapmaker | | \$795 |

TOLL FREE ORDER LINE • 800-MEGABYTE (634-2298)

CD-ROM and WORM DRIVES

- | | |
|--------------------------------------------------------|--------|
| Hitachi 1500S External CD-ROM Drive with Audio | \$729 |
| 1500S with Digital Audio Output | \$1229 |
| Hitachi 3500S Internal 1/2 Height CD-ROM Drive w/Audio | \$719 |
| NEC Intersect CD-ROM Drives for the Apple/Mac | CALL |
| Maxtor 800 MB WORM Drive | \$3899 |
| Optotech Laserbank 400 MB WORM Drive | \$2799 |

CD-Play (\$89) Pop-up utility that permits user to play all audio CDs on Hitachi and compatible drives. Output to headphones or amplifier.

CD-PlaySampler (\$149) Same features as CD-Play plus the ability to name two points on an audio CD and loop between them.

CD-AudioFile (\$149) Automatically creates database records of all your audio CDs. Allows you to store a preferred play sequence for each disk. Automatic recognition of CDs. Creates DBase compatible records.

CDP

Compact Disk Products
223 E. 85th St.
New York, NY 10028
Tel. 212-737-8400
Fax 212-439-9109
CompuServe 75530214

**Free 3 Month
Subscription to
CD-ROM Review
with orders over
\$300**

INTERNATIONAL ORDERS A SPECIALTY

Australian Agent: KEWTEL
145 Cotham Rd.
Kew, Victoria 3101
Tel. (03) 817-5933

Zero To 2000 In 60 Seconds. All Day Long.

Whether you need the blazing speed of a 2000 lpm band printer, the slower precision of a 24-wire desktop matrix printer, the versatile functionality of laser page printers, or anything in between, your prime source is Genicom.

We design and build an incredibly broad spectrum of high performance, durable

printers. A number of 9-, 18- and 24-wire dot matrix printers. And line matrix and band printers for high-volume users.

All backed by an aggressive, national service network.

So put your trust in Genicom printers. No matter how fast they go, they always outrun the competition.

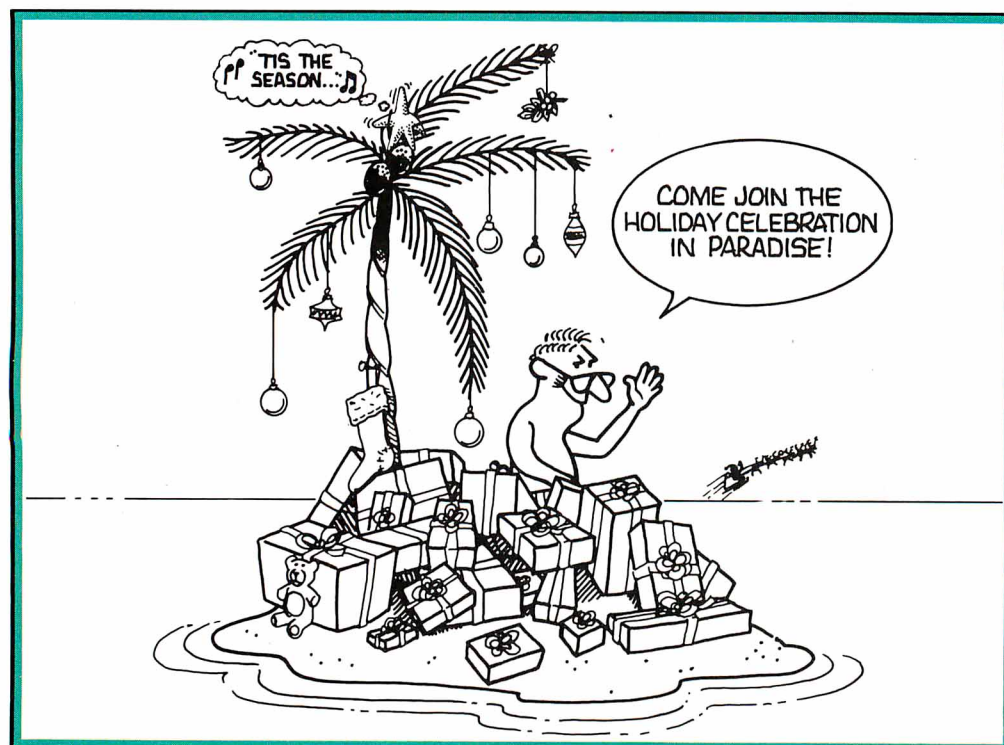


GENICOM

® Ideas that work as hard as you do.

Genicom Drive, Waynesboro, Virginia 22980
1-800-4-GENICOM.

PRICES YOU CAN FIND ONLY IN



CALL PROGRAMMER'S PARADISE TODAY and discover our commitment to bringing you the best software at the best prices. You'll also find software pros to help you select the product that you need plus immediate shipment on our stock of 1000 products and a 30-day money back guarantee. Paradise is ready and waiting for you.

LIST OURS

ASSEMBLY LANGUAGE	
Advantage Disassembler	295 279
MS Macro Assembler	150 99
OPTASM	125 105
SOURCER	100 89
w/ BIOS SOURCE	140 125
Turbo Assembler/Debugger	150 105
Visible Computer: 80286	100 89

BASIC	
db/LIB	139 121
GraphPak Professional	149 127
Facelt	99 90
MS BASIC/6.0	295 199
MS QuickBASIC	99 69
QuickPak Professional	149 129
QuickWindows Advanced	139 125
QuickWindows	79 70
w/Source	99 90
QuickTools	130 111
True BASIC	100 80
Turbo Basic	100 69
SoftCode	79 69

C LANGUAGE	
ADVANTAGE C++	495 479
C-terp	298 232
Lattice C	450 289
Microsoft C	450 299
QuickC	99 69
w/ serial mouse	249 149
RUN/C Professional	250 159
Turbo C v. 2.0	150 105
Turbo C v. 2.0 Professional	250 175

C LIBRARIES/UTILITIES	
C ASYNCH MANAGER	175 137
C TOOLS PLUS/5.0	129 99
C Utility Library	199 139
Essential Communications	185 121
Greenleaf Comm Library	229 169
Greenleaf Functions	209 155
Greenleaf SuperFunctions	265 189
Greenleaf TurboFunctions	109 79
PC-lint	139 101
Pre-C	295 159
TimeSlicer	295 279
Turbo C TOOLS	129 99

C GRAPHICS	
Essential Graphics	299 229
GraphicC	395 322
GSS Graphic Dev. Toolkit	495 409
HALO '88	325 229
MetaWINDOW/PLUS	275 232
TurboHALO	100 80

C SCREENS/WINDOWS	
C-Scape	299 282
Greenleaf DataWindows	295 209
HI-SCREEN XL	149 129
PANEL Plus	495 395
PANEL/QC or /TC	129 99
Vitamin C	225 162
Windows for Data	295 259

dBASE LANGUAGE	
CLARION	695 629
CLIPPER	695 439
Clear	100 90
w/ Laser & 24 pin option	150 129

RETURNS ARE A BREEZE



dBASE IV	
dbFast	695 CALL
dbBUG	100 75
FoxBASE+	195 179
Flipper	395 249
Integrated Dev. Library	195 182
R:Base for DOS	149 135
R & R	725 529
w/ Clipper module	150 129
SilverComm Library	199 179
Tom Rettig's HELP	150 139
Tom Rettig's Library	120 CALL
XDB-SQL	100 80

LIST OURS

FORTRAN COMPILERS	
Lahey F77 FORTRAN	477 429
Personal FORTRAN 77	95 89
MS FORTRAN	450 299
RM/FORTRAN	595 479

MODULA-2	
LOGITECH Modula-2	
Development System	249 199
Stony Brook Modula-2	
Development Package	345 309

PASCAL COMPILERS	
Microsoft Pascal	300 189
Turbo Pascal 5.0 Prof.	250 175
Turbo Pascal	150 105

TURBO PASCAL ADD-ONS	
DATABOSS	399 359
DATABOSS TOOLS	99 89
Pascal ASYNCH MANAGER	175 137
Overlay Manager	45 39
T-Debug Plus V. 4.0	45 40
Turbo ASYNCH PLUS	129 99
Turbo Geometry Library	150 135
Turbo MAGIC	199 179
Turbo Plus v. 5.0	100 80
Turbo POWER SCREEN	129 99
Turbo POWER TOOLS PLUS	129 99
Turbo POWER UTILITIES	95 80
Turbo Professional	99 80
Universal Graphics Library	150 121

EDITORS	
BRIEF	195 CALL
Epsilon	195 151
KEDIT	150 120
MKS VI	149 127
Multi-Edit	99 90
Norton Editor	75 70
Pi Editor	195 155
SPF/PC	245 185
VEDIT PLUS	185 115

FILE MANAGEMENT	
Btrieve	245 185
Xtrieve	245 189
Report Option	145 109
Btrieve/N	595 455

LIST OURS

CBTREE	159 141
c-tree	395 318
d-tree	495 395
r-tree	295 241
dbc III	250 169
dbc III PLUS	750 599
db—RETRIEVE	395 322
db—FILE	395 322
Informix 4GL	995 895
XQL	795 599

OBJECT-ORIENTED PROGRAMMING

ACTOR	495 423
ADVANTAGE C++	495 479
Smalltalk/V	100 85
Communications	50 45
EGA/VGA Color Ext.	50 45

1000 BRAND NAME PRODUCTS IN STOCK



Goodies #1, #2 or #3	50 45
Smalltalk/V 286	200 169

OPERATING SYSTEMS

Concurrent DOS 386	395 349
Microport:	
System V/AT (complete)	649 549
SANTA CRUZ OPER. (SCO):	
XENIX Sys V (comp.)	1295 999
WENDIN:	
Wendin-DOS	139 109

386 SOFTWARE

386 ASM/LINK	495 399
386MAX	75 66
386MAX PROFESSIONAL	129 115
DESQview	130 115
High C 386	895 799
Microport	
System V/386 (complete)	899 799
MS Windows/386	195 130
NDP C 386	595 529
NDP FORTRAN-386	595 529
SCO XENIX	
Sys. V 386 (complete)	1495 1195
VP/IX (2-USERS)	495 399
VP/IX (unlimited users)	995 799
VM/386	245 199

NEW RELEASES

386MAX PROFESSIONAL
Combines the popular 386MAX and new 386LOAD for total 386 memory management. Ideal tool for relocating network and other device drivers.
List: \$129 **Ours: \$115**

SCRIMAGE
Scrimage's new screen and menu design tool works in the format of the language you are using, without the overhead of a memory resident utility. Use Scrimage with dBASE III Plus, IV, dBASE Compilers, C or BASIC.
List: \$99 **Ours: \$90**

MKS LEX & YACC
New 100% UNIX compatible compiler construction tools for the DOS C programmer. MKS LEX & YACC work together efficiently to simplify the creation of new languages for applications, or to develop new programming language compilers.
List: \$249 **Ours: \$212**

PARADISE 1-800-445-7899

LIST OURS

ADDITIONAL PRODUCTS

Dan Bricklin's Demo II	195	179
Dan Bricklin's Demo Tutorial	50	45
MathCAD	395	282
Norton ON-Line Program		
Guides	100	75
Opt-Tech Sort	149	105
PC/Tools Deluxe	80	70
Periscope I	695	556
Periscope III 10 MHz	1495	1196
PolyAWK	99	79
PolyDoc	199	159
PVCS Corporate	395	332
Realia COBOL	995	799
w/ REALMENU	1145	929
TK Solver Plus	395	382
Vfeature Deluxe	120	111
X-Tree Pro	129	111

GREENLEAF SOFTWARE INC.

Greenleaf Functions	209	149
Greenleaf Comm Library	229	169
Greenleaf TurboFunctions	109	79
Greenleaf DataWindows	295	209
OS/2 Version	395	299
Greenleaf Bus. MathLib	325	229
Greenleaf SuperFunctions	265	189
Greenleaf MakeForm	125	99
OS/2 Version	170	135
Greenleaf DataMath Interface	75	69

MEDIA CYBERNETICS

Dr. HALO III	140	101
HALO DPE	195	162
HALO '88	325	229
HALO '88 for 2 compilers	475	329
HALO '88 - MS Developers	595	399
TurboHALO for C	100	80

MICROSOFT

MS BASIC/6.0	295	199
MS C	450	299
MS COBOL V. 3.0	900	599
MS Excel	495	329
MS FORTRAN	450	299
MS Macro Assembler	150	99
MS Mouse Serial or Bus		
w/Paintbrush		
& Mouse Menus	150	99
w/EasyCAD	175	119
w/Paintbrush & Windows	200	139
MS OS/2 Prog. Toolkit	350	229
MS QuickBASIC	99	69
MS QuickC	99	69
MS Sort	195	130
MS Windows/286	99	69
MS Windows/386	195	130
MS Windows Dev. Kit	500	319
MS Word	450	285

MORTICE KERN SYSTEMS

MKS Awk	99	85
MKS Lex & Yacc	249	212
MKS Make	149	127
MKS RCS	189	161
MKS SQPS	495	420
MKS Toolkit	199	169
MKS Trilogy	119	101
MKS Vi	149	129

SOFTWARE BOTTLING

Flash-up	79	60
Flash-up ToolBox	69	45
SoftCode	79	70
Speed Screen	49	45

WENDIN

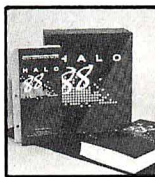
Operating System Toolbox	99	80
PCNX	99	80
PCVMS	99	80
Wendin-DOS	139	109
Application Dev. Kit	99	80

PROGRAMMER'S PARADISE:

HALO '88

The latest version of the industry standard. Now adds to the library, subroutines and devices which facilitate the development of contemporary applications such as Desktop Publishing, Document Management, Vision, and Imaging. HALO '88's powerful functions reduce development time by offering fast, effective subroutines. And no other graphics library supports more languages, more compilers or more devices.

LIST: \$325 OURS: \$229



HALO

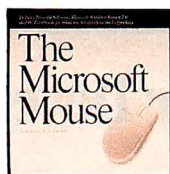
WENDIN-DOS VERSION 2.5

WENDIN-DOS is the new multi-tasking, multi-user MS-DOS replacement operating system for IBM compatible Personal Computers. Version 2.5 allows users to create hard disk partitions greater than 32 MB. WENDIN-DOS uses the MS-DOS file system, and supports MS-DOS commands while providing new ones to enable multi-tasking, file protection, and command language extensions and enables you to access your files with DOS, UNIX, or VAX/VMS style file names—whichever you prefer. WENDIN-DOS supports several users on the same computer. WENDIN-DOS now includes XTC, Wendin's ULTIMATE PROGRAMMER'S EDITOR! Minimum 512K memory.

LIST: \$139 OURS: \$109

WENDIN

MICROSOFT MOUSE



If your PC has you trapped into using the same old software, it's time you took a look at the new Microsoft Mouse. It's the fastest, most efficient way to tap into a wealth of business programs—at last count, over 250 compatible applications. It's also the mouse that outperforms all others. The new Microsoft Mouse points more accurately, works faster, takes up less desk space, and doesn't even require a pad.

LIST: \$150 OURS: \$99

Microsoft®

VEDIT PLUS 3.0



New VEDIT PLUS 3.0 is the ideal programmer's editor with stunning performance, speed and versatility. New features include 1000 level undo, columnar blocks, true regular expressions, an easy to use pull-down menu system and context sensitive help. You also get multiple file editing (any file size), windows, unlimited keystroke macros, total configurability and the most powerful macro programming language available. The new automatic compiler support is highly flexible and comes ready to use for Microsoft, Borland and many other compilers and assemblers.

LIST: \$185 OURS: \$115

CompuView

HOW WE WORK

PHONE ORDERS

Hours 9 AM—7 PM EST. We accept MasterCard, Visa, American Express. Include \$3.95 per item for shipping and handling. All shipments by UPS ground. Rush service available, ask for rates when you order.

MAIL ORDERS

POs by mail or fax are welcome. Please include phone number.

RETURN POLICY

Our "No Hassle" policy means if you're not satisfied with a product from Programmer's, simply return it within 30 days for a refund. Some manufacturer's products cannot be returned once disk seals are broken, so check before you buy.

TECHNICAL SUPPORT FROM SOFTWARE PROS



INTERNATIONAL SERVICE

Take advantage of our International business number for details on export charges and exchange rates. Payments should be made in U.S. dollars.

DEALERS AND CORPORATE ACCOUNTS

Call and ask for our catalog and special volume discounts.

UNBEATABLE PRICES

We'll match lower nationally advertised prices.

In NY: 914-332-4548

Customer Service:

914-332-0869

International Orders:

914-332-4548

Telex: 510-601-7602

Fax: 914-332-4021

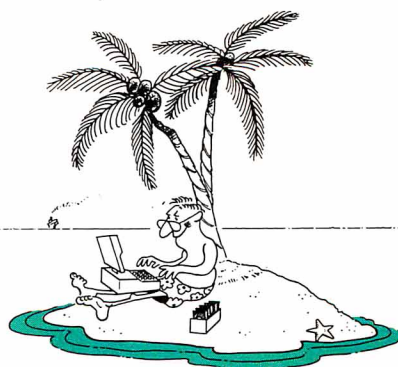
Call or Write for Latest Free Catalog!

1-800-445-7899

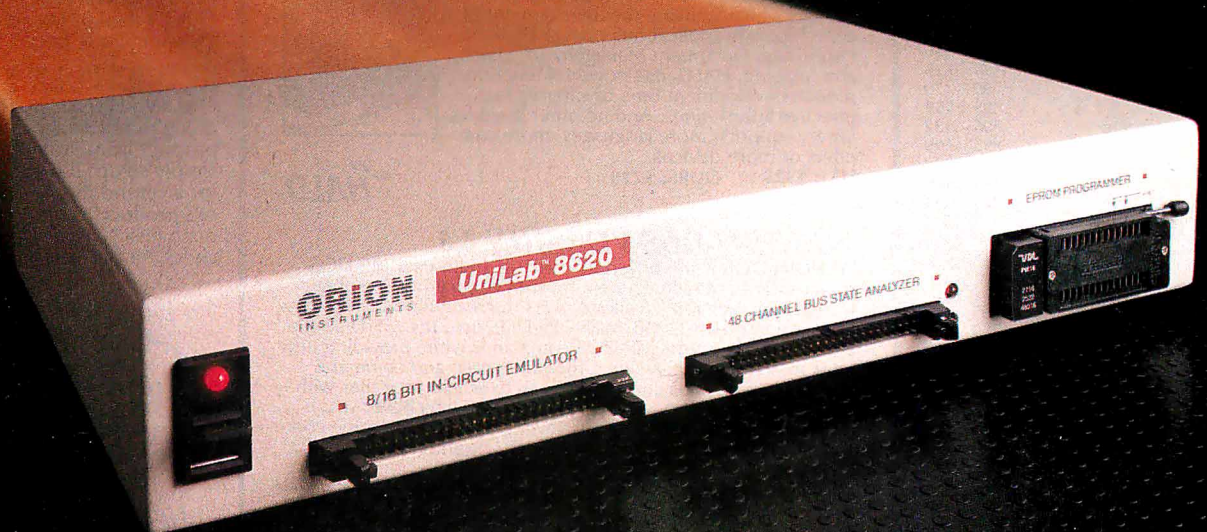
Programmer's

Paradise™

A Division of Magellan Software Corp
55 South Broadway, Tarrytown, NY 10591



0 to 60 in 5 seconds



with new UniLab Microprocessor Development Tools

- 64Kbytes from hard disk to emulation memory in 5 seconds. That's moving. But today you've got to be fast just to stay in the race for better microprocessor designs.
- The secret is a new, high-speed parallel interface: the Orion bus. Which zips data between your PC/AT and the 8620 analyzer-emulator, breaking the RS-232 bottleneck.
- The 8620 with O-bus gives you complete program diagnosis — and solutions — in real time. For more than 150 different microprocessors. Using the same command set environment.
- A generous 2730 trace-cycle buffer with selective filtering lets you cut through the clutter and display just the traces you wish. And you get 1μsec resolution in program time measurement. Plus continuous InSight monitoring of your program's key functions as they are performed.



Showmem		Fuel Injection Controller				Memory																									
This display shows the values held in registers and selected memory locations. Display is updated 5 times/sec. Press F1 for help.																															
<div> <div>Download</div> <table border="1"> <thead> <tr> <th>Disposit</th> <th>Processor</th> <th>Temp</th> <th>Vacuum</th> <th></th> <th></th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>1736</td> <td>1200-21</td> <td>1187</td> <td>1200-25</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>87</td> <td>2000</td> <td>82</td> <td>7000</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> </div>								Disposit	Processor	Temp	Vacuum					1736	1200-21	1187	1200-25					87	2000	82	7000				
Disposit	Processor	Temp	Vacuum																												
1736	1200-21	1187	1200-25																												
87	2000	82	7000																												
0	acceler					8	cold																								
1	air cond					9	stall																								
2	vacuum					10	stuck																								
3	alarm					11	alarm																								
4	alarm					12	ping																								
5	starter					13	temp_3																								
6	stop					14	pres_1																								
7						15	fault																								

Address		Data		Hex		Asm	
PC=0105	4F=0065	(w-r-a-h)	PC=0105	4F=0060	HL=4473	PC=0105	HL=0067
			PC=0105		Carry		
02=0000	4F=FFFF	32-r-a-h	PC=0420	4F=0053	HL=0018		count=0027

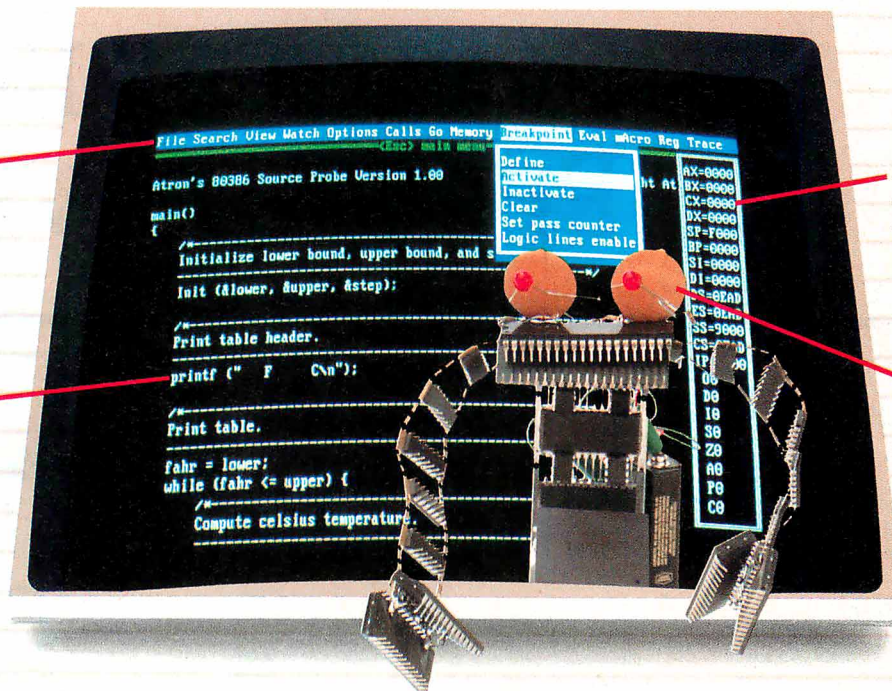
Global=delay		file	cycle	12	13	14	message	status
0000-0002	00	00	00	00	00	00	00	00
0003-0004	00	00	00	00	00	00	00	00
0005-0006	00	00	00	00	00	00	00	00
0007-0008	00	00	00	00	00	00	00	00
0009-000A	00	00	00	00	00	00	00	00
000B-000C	00	00	00	00	00	00	00	00
000D-000E	00	00	00	00	00	00	00	00
000F-0010	00	00	00	00	00	00	00	00
0011-0012	00	00	00	00	00	00	00	00
0013-0014	00	00	00	00	00	00	00	00
0015-0016	00	00	00	00	00	00	00	00
0017-0018	00	00	00	00	00	00	00	00
0019-001A	00	00	00	00	00	00	00	00
001B-001C	00	00	00	00	00	00	00	00
001D-001E	00	00	00	00	00	00	00	00
001F-0020	00	00	00	00	00	00	00	00
0021-0022	00	00	00	00	00	00	00	00
0023-0024	00	00	00	00	00	00	00	00
0025-0026	00	00	00	00	00	00	00	00
0027-0028	00	00	00	00	00	00	00	00
0029-002A	00	00	00	00	00	00	00	00
002B-002C	00	00	00	00	00	00	00	00
002D-002E	00	00	00	00	00	00	00	00
002F-0030	00	00	00	00	00	00	00	00
0031-0032	00	00	00	00	00	00	00	00
0033-0034	00	00	00	00	00	00	00	00
0035-0036	00	00	00	00	00	00	00	00
0037-0038	00	00	00	00	00	00	00	00
0039-003A	00	00	00	00	00	00	00	00
003B-003C	00	00	00	00	00	00	00	00
003D-003E	00	00	00	00	00	00	00	00
003F-0040	00	00	00	00	00	00	00	00
0041-0042	00	00	00	00	00	00	00	00
0043-0044	00	00	00	00	00	00	00	00
0045-0046	00	00	00	00	00	00	00	00
0047-0048	00	00	00	00	00	00	00	00
0049-004A	00	00	00	00	00	00	00	00
004B-004C	00	00	00	00	00	00	00	00
004D-004E	00	00	00	00	00	00	00	00
004F-0050	00	00	00	00	00	00	00	00
0051-0052	00	00	00	00	00	00	00	00
0053-0054	00	00	00	00	00	00	00	00
0055-0056	00	00	00	00	00	00	00	00
0057-0058	00	00	00	00	00	00	00	00
0059-005A	00	00	00	00	00	00	00	00
005B-005C	00	00	00	00	00	00	00	00
005D-005E	00	00	00	00	00	00	00	00
005F-0060	00	00	00	00	00	00	00	00
0061-0062	00	00	00	00	00	00	00	00
0063-0064	00	00	00	00	00	00	00	00
0065-0066	00	00	00	00	00	00	00	00
0067-0068	00	00	00	00	00	00	00	00
0069-006A	00	00	00	00	00	00	00	00
006B-006C	00	00	00	00	00	00	00	00
006D-006E	00	00	00	00	00	00	00	00
006F-0070	00	00	00	00	00	00	00	00
0071-0072	00	00	00	00	00	00	00	00
0073-0074	00	00	00	00	00	00	00	00
0075-0076	00	00	00	00	00	00	00	00
0077-0078	00	00	00	00	00	00	00	00
0079-007A	00	00	00	00	00	00	00	00
007B-007C	00	00	00	00	00	00	00	00
007D-007E	00	00	00	00	00	00	00	00
007F-0080	00	00	00	00	00	00	00	00
0081-0082	00	00	00	00	00	00	00	00
0083-0084	00	00	00	00	00	00	00	00
0085-0086	00	00	00	00	00	00	00	00
0087-0088	00	00	00	00	00	00	00	00
0089-008A	00	00	00	00	00	00	00	00
008B-008C	00	00	00	00	00	00	00	00
008D-008E	00	00	00	00	00	00	00	00
008F-0090	00	00	00	00	00	00	00	00
0091-0092	00	00	00	00	00	00	00	00
0093-0094	00	00	00	00	00	00	00	00
0095-0096	00	00	00	00	00	00	00	00
0097-0098	00	00	00	00	00	00	00	00
0099-009A	00	00	00	00	00	00	00	00
009B-009C	00	00	00	00	00	00	00	00
009D-009E	00	00	00	00	00	00	00	00
009F-00A0	00	00	00	00	00	00	00	00
00A1-00A2	00	00	00	00	00	00	00	00
00A3-00A4	00	00	00	00	00	00	00	00
00A5-00A6	00	00	00	00	00	00	00	00
00A7-00A8	00	00	00	00	00	00	00	00
00A9-00AA	00	00	00	00	00	00	00	00
00AB-00AC	00	00	00	00	00	00	00	00
00AD-00AE	00	00	00	00	00	00	00	00
00AF-00B0	00	00	00	00	00	00	00	00
00B1-00B2	00	00	00	00	00	00	00	00
00B3-00B4	00	00	00	00	00	00	00	00
00B5-00B6	00	00	00	00	00	00	00	00
00B7-00B8	00	00	00	00	00	00	00	00
00B9-00BA	00	00	00	00	00	00	00	00
00BB-00BC	00	00	00	00	00	00	00	00
00BD-00BE	00	00	00	00	00	00	00	00
00BF-00C0	00	00	00	00	00	00	00	00
00C1-00C2	00	00	00	00	00	00	00	00
00C3-00C4	00	00	00	00	00	00	00	00
00C5-00C6	00	00	00	00	00	00	00	00
00C7-00C8	00	00	00	00	00	00	00	00
00C9-00CA	00	00	00	00	00	00	00	00
00CB-00CC	00	00	00	00	00	00	00	00
00CD-00CE	00	00	00	00	00	00	00	00
00CF-00D0	00	00	00	00	00	00	00	00
00D1-00D2	00	00	00	00	00	00	00	00
00D3-00D4	00	00	00	00	00	00	00	00
00D5-00D6	00	00	00	00	00	00	00	00
00D7-00D8	00	00	00	00	00	00	00	00
00D9-00DA	00	00	00	00	00	00	00	00
00DB-00DC	00	00	00	00	00	00	00	00
00DD-00DE	00	00	00	00	00	00	00	00
00DF-00E0	00	00	00	00	00	00	00	00
00E1-00E2	00	00	00	00	00	00	00	00
00E3-00E4	00	00	00	00	00	00	00	00
00E5-00E6	00	00	00	00	00	00	00	00
00E7-00E8	00	00	00	00	00	00	00	00
00E9-00EA	00	00	00	00	00	00	00	00
00EB-00EC	00	00	00	00	00	00	00	00
00ED-00EE	00	00	00	00	00	00	00	00
00EF-00F0	00	00	00	00	00	00	00	00
00F1-00F2	00	00	00	00	00	00	00	00
00F3-00F4	00	00	00	00	00	00	00	00
00F5-00F6	00	00	00	00	00	00	00	00
00F7-00F8	00	00	00	00	00	00	00	00
00F9-00FA	00	00	00	00	00	00	00	00
00FB-00FC	00	00	00	00	00	00	00	00
00FD-00FE	00	00	00	00	00	00	00	00
00FF-0100	00	00	00	00	00	00	00	00
0101-0102	00	00	00	00	00	00	00	00
0103-0104	00	00	00	00	00	00	00	00
0105-010								

PRODUCTS IN PERSPECTIVE

- 67 **What's New**
- 97 **Short Takes**
Boomerang
Think C
SOTA 286i
ALPS Allegro 24
FamilyCare Software
- First Impressions**
- 107 The Compaq 286 SLT
- Reviews**
- 162 Plotters in Perspective
- 183 The Sun386i
- 193 Dell's System 220
- 199 QuickCapture
- 207 Merge 386
- 215 Slick
- 223 Agenda
- 231 MacDraw II
- 236 Review Update:
Benchmarks at a Glance



IT'S TIME TO DO SOME SERIOUS 386 BUGBUSTING!



PROBE's menu bar and pull-down menus set a new standard for debugger interfaces.

POP registers up and down with a single key.

PROBE has source-level debugging to let you "C" your program.

This is an out-of-range memory-overwrite bug. Since it is interrupt related, it only appears in real time.

Welcome to your nightmare. Your company has bet the farm on your product. Your demonstration wowed the operating committee, and beta shipments were out on time. Then wham!

All your beta customers seemed to call on the same day. "Your software is doing some really bizarre things," they say. Your credibility is at stake. Your profits are at stake. Your sanity is at stake.

THIS BUG'S FOR YOU

You rack your brain, trying to figure something out. Is it a random memory overwrite? Or worse, an overwrite to a stack-based local variable? Is it sequence dependent? Or worse, randomly caused by interrupts? Overwritten code? Undocumented "features" in the software you're linking to? And to top it off, your program is too big. The software debugger, your program and its symbol table can't fit into memory at the same time. Opening a bicycle shop suddenly isn't such a bad idea.

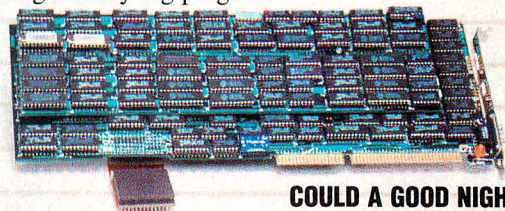
THIS DEBUGGER'S FOR YOU

Announcing the 386 PROBE™ Bugbuster,* from Atron. Nine of the top-ten software developers sleep better at night because of Atron hardware-assisted debuggers. Because they can set real-time breakpoints which instantly detect memory reads and writes.

Now, with the 386 PROBE, you have the capability to set a *qualified breakpoint*, so the breakpoint triggers only if the events are coming from the wrong procedures. So you don't have to be halted by breakpoints from legitimate areas. You can even detect obscure, sequence-dependent problems by stopping a breakpoint only after a specific chain of events has occurred in a specific order.

Then, so you can look at the cause of the problem, the 386 PROBE automatically stores the last 2K cycles of program execution. Although other debuggers may *try* to do the same thing, Atron is the only company in the world to dequeue the pipelined trace data so you can easily understand it.

Finally, 386 PROBE's megabyte of hidden, write-protected memory stores your symbol table and debugger. So your bug can't roach the debugger. And so you have room enough to debug a really big program.



COULD A GOOD NIGHT'S SLEEP PUT YOU IN THE TOP TEN?

Look at it this way. Nine of the top-ten software products in any given category were created by Atron customers. Maybe their *edge* is — a good night's sleep.

Call and get your free, 56-page bugbusting bible today. And if you're in the middle of a nightmare right now, give us a purchase order number. We'll FEDEX you a sweet dream.



atron

BUGBUSTERS

A division of Northwest Instrument Systems, Inc.
Saratoga Office Center • 12950 Saratoga Avenue
Saratoga, CA 95070 • Call 408/253-5933 today.

WHAT'S NEW

SYSTEMS

3Com's Answer to a LAN Workstation

The 3Station/2E, built around an Ethernet local-area network, is 3Com Corp.'s latest answer to an intelligent personal computer for the business masses.

Unlike the 3Station that it replaces, the 3Station/2E provides for graphics- and computation-intensive applications such as desktop publishing and spreadsheets. It also has a faster clock rate. The 256K-byte video display buffer supports the higher-resolution

VGA (800 by 600 pixels) that is used in Microsoft Windows, AutoCAD, Ventura Publisher, and GEM Desktop Publisher.

Specifically, the 3Station/2E motherboard combines a 10-MHz 80286 microprocessor with a VGA graphics driver, 1 to 5 megabytes of RAM, an Ethernet connection, and a socket for an optional math coprocessor. What this workstation doesn't have is a disk drive—mass storage can sometimes best be managed

by the network file server, 3Com says.

With 3Com's Maxess SNA Gateway software/card combination, PCS/TCP, and PCS/XNS software, the 3Station/2E provides for communication with Systems Network Architecture, Transmission Control Protocol/Internet Protocol, and asynchronous host connectivity, respectively.

You can connect some peripherals with either of the two RS-232C asynchronous serial ports (9- and 25-pin),

and you can connect a printer through the Centronics-compatible parallel port.

Each 3Station/2E can function as a DOS workstation or as an OS/2 workstation. The network operating system software can be 3Com's 3+ or 3+ Open LAN manager or Novell's NetWare, version 2.1.

Price: \$2495, without a monitor.

Contact: 3Com Corp., 3165 Kifer Rd., Santa Clara, CA 95052, (408) 562-6400. **Inquiry 1101.**

Laptops Follow Function

The Toshiba T5200 laptop, an 80386-based 20-MHz machine with 2 megabytes of RAM and a VGA slot, is now the company's most powerful portable.

The gas-plasma display has built-in VGA capabilities, and there's a VGA port for adding a bigger monitor. It has 16-gray-scale functionality, with a resolution of 640 by 480 pixels. Standard equipment also includes a 40-megabyte hard disk drive and a 1.44-megabyte 3½-inch floppy disk drive that's PS/2-compatible.

The keyboard is a 91-key AT compatible with separate cursor-control keys and a numeric keypad. In all, the portable weighs almost 19 pounds and is about 4 inches thick—a tad heavy and probably too big for your average briefcase.

Each system comes with a full-length 16-bit expansion slot and a half-length 8-bit expansion slot.

Options include an internal 2-megabyte memory module that's compatible with the

Lotus/Intel/Microsoft Expanded Memory Specification, a 2400-bit-per-second internal Hayes-compatible modem, and a carrying case. **Price:** \$9499 with 40-megabyte hard disk drive; \$10,999 with 100-megabyte hard disk drive.

Contact: Toshiba America, Inc., Information Systems Division, 9740 Irvine Blvd., Irvine, CA 92718, (714) 583-3000.

Inquiry 1100.

Hewlett-Packard's 80386

The Hewlett-Packard Vectra QS/16 is a 32-bit, 80386-based desktop box that's basically a smaller version of the Vectra RS/16 floor-standing unit.

The QS/16 can run MS-

DOS, OS/2, or Santa Cruz Operations' Xenix. But HP Vectra DOS and Microsoft Windows/386 are included. The basic machine comes with 1 megabyte of memory (with space for 16 megabytes on the motherboard), a 1.2-megabyte 5¼-inch floppy drive, and seven expansion slots.

Also standard is a hard disk controller, an RS-232C port, and a Centronics parallel port. There's an 80387 numeric coprocessor socket and an HP Human Interface Loop Port that simultaneously supports up to seven input devices, such as a touchscreen, a mouse, and a graphics tablet.

A 40-megabyte hard disk drive with disk caching is available as an option, as is a 14-inch color or monochrome display and a 3½-inch floppy drive. An AT-style 101-key keyboard is also standard.

Price: \$3995; \$5095 with a

40-megabyte hard disk drive. **Contact:** Hewlett-Packard Co., Inquiries, 19310 Pruneridge Ave., Cupertino, CA 95014, or call HP as listed in your local white pages.

Inquiry 1102.

The Portable with a Desktop Punch

Supporting a 20-MHz 80286 microprocessor and weighing much less than its desktop cousins is the LCD-286 portable from Scantech Computer Systems.

It comes standard with 1 megabyte of zero-wait-state RAM, a 20-megabyte hard disk drive, and a 1.2-megabyte 5¼-inch floppy disk drive. The LCD screen is 80 columns by 25 rows. Inside the machine are three full-length and two half-length slots.

Support for CGA and EGA graphics is also available.

Price: \$3495; \$3995 for CGA version; \$5495 for EGA version.

Contact: Scantech Computer Systems, Inc., 12981 Ramona Blvd., Unit I&H, Irwindale, CA 91706, (818) 960-2999.

Inquiry 1103.

continued

SEND US YOUR NEW PRODUCT RELEASE

We'd like to consider your product for publication. Send us full information, including its price, ship date, and an address and telephone number where readers can get further information. Send to New Products Editor, BYTE, One Phoenix Mill Lane, Peterborough, NH 03458. Information contained in these items is based on manufacturers' written statements and/or telephone interviews with BYTE reporters. BYTE has not formally reviewed each product mentioned. These items, along with additional new product announcements, are posted regularly on BIX in the microbytes.sw and microbytes.hw conferences.

Tapes Store Gigabytes at File Servers

Because networks are generally using central-file-server technology, where the main memory backup systems need to be located at the file servers, MIS managers are interested in gigabyte-capacity tape storage.

The portable MaynStream 2200HS allows for backup of more than 2 gigabytes of data on a removable and rewritable 8-millimeter cassette tape. Data transfer is rated at 250K bytes per second, and Maynard's standard multitasking software is included.

About the size of a hard disk drive, the 2200HS is based on helical-scan technology. This involves magnetically writing on the tape in thin diagonal stripes, reducing the size necessary for the Maxell cassette tapes. Each cassette tape is slightly larger than a standard audiocassette tape.

Features include read-after-write error checking and automatic rewrite, an error-correction code that corrects up to 264 bytes in each data block, and a head-to-tape speed of 150 inches per second.

The software has two main features to help you maintain up-to-date files. You can save backup specifications in a script file to automate routine backup sessions. You can also make the routine backups automatically using a background program called Autoback.

The Archive feature saves hard disk space by making it easier for you to transfer inactive hard disk files onto a backup cassette. The basic XT- and AT-compatible package includes software, drive, controller cards, cables, and a cassette. PS/2 is offered as an option.



Gigabytes for your file server.

Price: \$6995; \$7095 for PS/2 models.

Contact: Maynard Electronics, 460 East Semoran Blvd., Casselberry, FL 32707, (407) 331-6402.
Inquiry 1104.

Portable Printer with Desktop Capabilities

The ExpressWriter 311 is a compact, 11-pound, 24-pin letter-quality printer that prints 180 characters per second in draft mode and features a maximum resolution of 360 by 360 dots per inch.

It includes a 16K-byte buffer with an additional 32K bytes available through an optional RAM card that can be used as a buffer or for downloadable fonts. Three resident emulations include Toshiba/Qume, IBM ProPrinter, and Epson LQ Series.

Resident fonts include high-speed draft, Courier, Prestige, Elite, condensed, and proportional. Paper can be as wide as 10 inches.

Price: \$589.

Contact: Toshiba America, Inc., Information Systems Division, 9740 Irvine Blvd., Irvine, CA 92718, (714) 583-3000.
Inquiry 1105.

Scanner Handles 4388 Pixels per Inch

Nikon has a full-color film scanner for graphics art and desktop publishing. It's the Nikon LS-3500 film scanner, and it reads both color and monochrome 35mm film positives and negatives directly.

Existing film scanners use a 300-pixel-per-inch reading resolution. The LS-3500 will read at a resolution of 6144 by 4096 pixels, or 4388 pixels per inch. It can be connected to computers through RS-232C and GPIB interfaces, with half-length cards sold by many companies besides Nikon.

Operation of the 11- by 15- by 6-inch, 13-pound scanner involves placing the 35mm slide in the film holder; the scanning sequence starts immediately. A CCD element strip, consisting of 4096 elements in a vertical bar, reads image data in lines as the film passes in front of the CCD chip. The film passes three times in front of the CCD element—once each for blue, green, and red—with 6144 vertical increments scanned for each color.

The image data is automatically, continuously transferred to the computer for processing. At the GPIB rate of

750K bytes per second, a 4096-byte vertical strip is transferred every 5 milliseconds to the host computer bus. The 6144 vertical readings take 15 seconds each, with three vertical readings per slide, totaling 45 seconds per slide.

Once the image is stored in your PC, XT, AT, or Mac II, you can combine the image data with word processing data for printing, or you can store the image on a hard disk, for example.

Price: \$9995 without GPIB card (which is priced about \$450 from other vendors).
Contact: Nikon, Inc., Electronic Imaging Division, 623 Stewart Ave., Garden City, NY 11530, (516) 222-0200.
Inquiry 1106.

Ventek Upgrades VGA

Two pages side by side or one page with a display resolution of 1280 by 1024 pixels are two of the features of Ventek's AT-compatible AT 2000 desktop publishing/CAD system.

The system consists of a board with built-in VGA and a 20-inch monitor. Each board includes proprietary hardware for updating a standard 640- by 480-pixel screen at twice the rate, Ventek claims.

In its high-resolution mode, drivers are supplied for Microsoft Windows, AutoCAD, Ventura Publisher, GEM, Lotus 1-2-3, and WordPerfect. With the MS-Windows driver, you can use Aldus PageMaker.

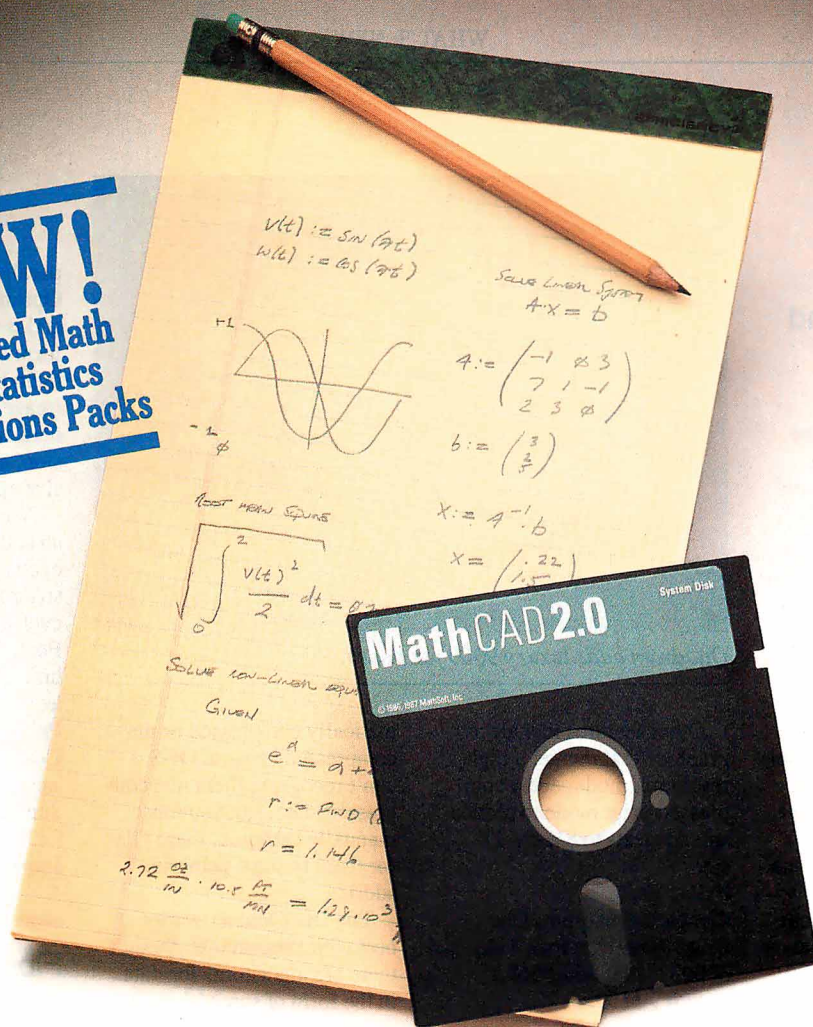
Price: \$2695.

Contact: Ventek Corp., 31336 Via Colinas, Suite 102, Westlake Village, CA 91362, (818) 991-3868.

Inquiry 1107.

continued

NEW!
Advanced Math
and Statistics
Applications Packs



Your pad or ours?

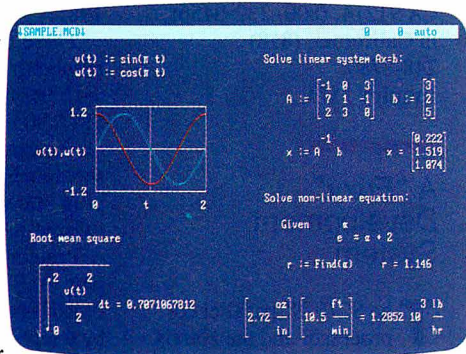
If you perform calculations, the answer is obvious.

MathCAD 2.0.

It's everything you appreciate about working on a scratch-pad—simple, free-form math—and more. More speed. More accuracy. More flexibility.

Just define your variables and enter your formulas anywhere on the screen. MathCAD formats your equations as they're typed. Instantly calculates the results. And displays them exactly as you're used to seeing them—in real math notation, as numbers, tables or graphs.

MathCAD is more than an equation solver. Like a scratchpad, it allows you to add



text anywhere to support your work, and see and record every step. You can try an unlimited number of what-ifs. And print your entire calculation as an integrated document that anyone can understand.

Plus, MathCAD is loaded with powerful

built-in features. In addition to the usual trigonometric and exponential functions, it includes built-in statistical functions, cubic splines, Fourier transforms, and more. It also handles complex numbers and unit conversions in a completely transparent way.

Yet, MathCAD is so easy to learn, you'll be using its full power an hour after you begin.

What more could you ask for? How about two new applications packs to increase your productivity?

The **Advanced Math Applications Pack** includes 16 applications like eigenvalues and eigenvectors of a symmetric matrix, solutions of differential equations, and polynomial least-squares fit.

The **Statistics Applications Pack** lets you perform 20 standard statistical routines such as multiple linear regression, combinations and permutations, finding the median, simulating a queue, frequency distributions, and much more.

MathCAD lets you perform calculations in a way that's faster, more natural, and less error-prone than the way you're doing them now—whether you use a calculator, a spreadsheet, or programs you write yourself. So come on over to MathCAD and join 45,000 enthusiastic users.

For more information, contact your dealer or call 1-800-MATHCAD (In MA: 617-577-1017).

Requires IBM PC® or compatible, 512KB RAM, graphics card.
IBM PC® International Business Machines Corporation.
MathCAD® MathSoft, Inc.

MathCAD®

MathSoft, Inc., One Kendall Sq., Cambridge, MA 02139

DECEMBER 1988 • BYTE 69

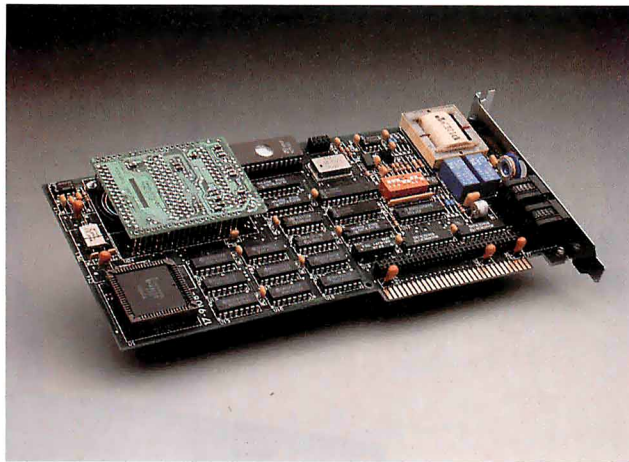
Faxes Almost Send Themselves

An on-board 80188 microprocessor lets the 9600-bit-per-second, $\frac{3}{4}$ -length JT Fax 9600 PC board transmit to the 3 million Group III facsimile and PC faxes in the world, according to the manufacturer.

Group III (denoting the best facsimile standard using analog telecommunications transmission) limits the data rate to 9600 bits per second. Group IV facsimiles can travel at up to 64K bits per second. But Group IV requires *digital* telecommunications transmission—something telephone companies are working furiously toward but that isn't currently available on more than 10 percent of all telecommunications lines.

The JT Fax 9600 PC is designed with a proprietary "convert-and-send capability," Quadram claims, which automatically strips out printer-command sequences and subsequently converts the file to ASCII and to fax format as it's transmitting. For one page, it takes about 30 seconds.

Software is memory resident, using 190K bytes of RAM. Should you need that RAM for a memory-intensive application, for example, you can remove the software from active memory with an Exit command at the DOS prompt. Another helpful feature permits transmission of faxes using the software Print command so a fax can be sent from the screen from a stored file, or created from previously received faxes or scanner input. Received faxes can be displayed on-screen, stored on disk, or output to a dot-matrix or laser printer.



Quadram adds luxury 9600 fax board.

Other features include a graphics/text merge, a high-resolution mode, and a compressed print mode to reduce spreadsheets to 8½-by-11 size.

Price: \$795.

Contact: Quadram, One Quad Way, Norcross, GA, 30093, (404) 564-5566.

Inquiry 1109.

Double Your Disk Capacity

The DiskDoubler is a half-length card that doubles storage capacity on all your disk drives—floppy drives, hard drives, and RAM drives.

It uses a proprietary data-compression technology and is compatible with the IBM PC, XT, AT, and compatibles that operate under DOS 2.0 or higher. The DOS shell, a TSR (terminate-and-stay-resident) program called DD.COM, acts to compress and uncompress the files as they are handled by DOS.

The interface to the disk is interactive and does not require that the entire file be uncompressed for use—it automatically compresses and uncompresses only those being addressed.

System files with the extensions .EXE, .COM, .SYS, .BAT, and .BIN aren't auto-

matically compressed or uncompressed because DOS can't recognize them in a compressed state. But you must manually compress these files for them to work with the add-in.

The DiskDoubler works best with English text, though there are algorithms for data in the form of spreadsheets and dBASE files. Compression ratios vary, so some disk capacities could be more than doubled.

Price: \$189.

Contact: Datran Corp., 2505 Foothill Blvd., La Crescenta, CA 91214, (800) 332-0456; in California, (818) 248-8780.

Inquiry 1111.

A "Foxy" Development System

The SC/FOX parallel coprocessor and the Harris RTX 2000 real-time processor come bundled with a software development system that includes a Forth optimizing compiler, editor, and run utility operating from MS-DOS.

SC/FOX denotes the manufacturer, Silicon Composers, and the idea of the

parallel coprocessor, Forth-Optimized Express. All you add is code, and you can perform multiple applications, including real-time control, image and signal processing, data acquisition and compression, and computation-intensive applications.

All nonmemory access instructions execute in one clock cycle. Memory access instructions execute in two cycles. Up to five high-level Forth instructions can be combined and executed in parallel in a single clock cycle.

Price: \$1995.

Contact: Silicon Composers, Inc., 210 California Ave., Suite K, Palo Alto, CA 94306, (415) 322-8763.

Inquiry 1110.

Fiber Optic Integration

Proteon has introduced integrated token-ring cards for its ProNet 10, which the company claims was the first commercially available token-ring network in 1981.

These new cards, model number p1307, have the optical fiber connection with an SMA 905 connector directly on the card rather than on a separate box, which the cards plug into with shielded twisted-pair cabling.

Proteon's shielded twisted pair (unlike the unshielded twisted-pair cabling installed by telephone companies) allows transmission distances of up to 160 meters.

Each p1307 plugs into the expansion slot of an IBM PC, XT, AT, or compatible.

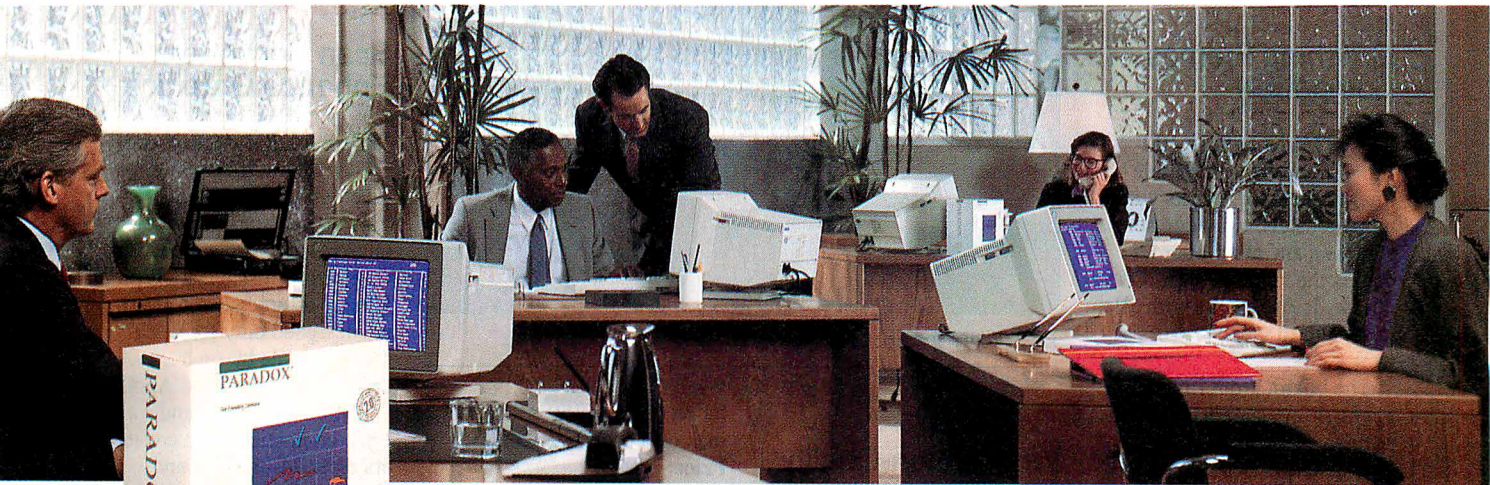
Price: \$1200.

Contact: Proteon, Inc., Two Technology Dr., Westborough, MA 01581, (617) 898-2800.

Inquiry 1112.

continued

Why Paradox 2.0 makes your network run like clockwork



Paradox® runs smoothly, intelligently and so transparently that multiple users can access the same data at the same time—without being aware of each other or getting in each other's way.

With Paradox news travels fast and it's always accurate

Paradox *automatically* updates itself with a screen-refresh that ensures that all the data is up to date and accurate all the time. Record-locking, Paradox-style, safeguards data integrity by preventing for example, two different users from making changes to the same record at the same time.

How to make your multiuser network work

To run Paradox 2.0 or the Paradox Network Pack on a network, you need:

- Novell with Novell Advanced Netware version 2.0A or higher
- 3Com 3Plus with 3Com 3+ operating system version 1.0, 1.1 or higher
- IBM Token Ring or PC Network with IBM PC Local Area Network Program version 1.12 or higher
- Torus Tapestry version 1.45 or higher
- AT&T Starlan version 1.1 or higher
- Banyan VINES version 2.10
- Other network configurations that are 100% compatible with DOS 3.1 and one of the listed networks

System Requirements for the Network Workstation

- DOS 3.1 or higher
- 640K RAM
- Any combination of hard, floppy, or no disk drives
- Compatible monochrome, color, or EGA monitor with adapter

*Customer satisfaction is our main concern; if within 60 days of purchase this product does not perform in accordance with our claims, call our customer service department, and we will arrange a refund.

Paradox is a registered trademark of Ansa Software. Ansa is a Borland International Company. Other brand and product names are registered trademarks or trademarks of their respective holders. Copyright ©1988 Borland International. BI 1243

“When I saw the record-locking and autorefresh in action, I couldn't believe it. Here was a true network application, a program that can actually take advantage of a network to provide more features and functions, things that can't be done with a stand-alone PC.

Aaron Brenner, LAN Magazine

With Version 2.0, Paradox becomes a sophisticated multiuser product that boasts an impressive selection of data-production features and password-security levels.

Rusel DeMaria, PC Week ”

Paradox responds instantly to “Query-by-Example”

The method you use to ask questions is called Query-by-Example. Instead of spending time figuring out *how* to do the query, you simply give Paradox an example of the results you're looking for. Paradox picks up the example and automatically seeks the fastest way of getting the answer.

Queries are flexible and interactive. And in Paradox, unlike in other databases, it's just as simple to query more than one table as it is to query one.

“The program elegantly handles all the chores of a multiuser database system with little or no effort by network users.

Mark Cook and Steve King,
Data Based Advisor ”

“Paradox... has quickly become the state-of-the-art product among PC database managers... Paradox still reigns supreme as the thinking user's DBMS.

Jim Seymour, PC Magazine ”

You don't have to be a genius to use Paradox

Even if you're a beginner, Paradox is the only relational database manager that you can take out of the box and begin using right away.

Because Paradox is driven by the very latest in artificial intelligence technology, it does almost everything for you—except take itself out of the box. (If you've ever used 1-2-3® or dBASE,* you already know how to use Paradox. It has Lotus-like menus, and Paradox documentation includes “A Quick Guide to Paradox for Lotus Users” and “A Quick Guide to Paradox for dBASE users.”) Paradox, it makes your network work.

60-Day Money-back Guarantee*

For a brochure or the dealer nearest you
Call (800) 543-7543



Grabbing Frames Compatibly

The Variable-Scan 100-AT, an AT-compatible image processor, works with more nonstandard video sensors than any other board, claims the manufacturer. Of course, it also works with all the standard video sensors as well.

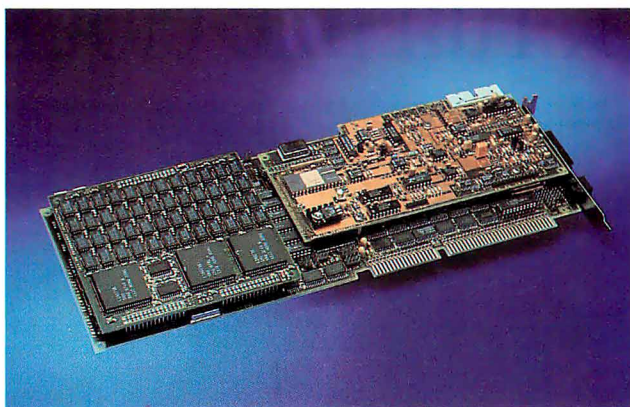
The board, from Imaging Technology, supports image acquisition of up to 1024 by 1024 pixels on RS-170 and CCIR cameras, as well as on CCD sensors that don't conform to fixed industry standards such as linescan, fast-frame-rate area scan, X-ray, and high-resolution cameras—which are used for many specialized applications.

The VS 100-AT includes a trigger that allows the board to be synchronized with external events, which helps in capturing images when a part of a conveyor belt passes under a camera for inspection.

A 768- by 512-pixel image-capture mode provides for square pixel acquisition and display when working with CCIR cameras. A programmable gain and level is used to correct fluctuations in lighting and to interface with non-standard video signals with output levels. A digital input port eliminates the interim digitization step if the video sensor outputs digital data directly.

Software support comes from a library that includes about 150 high-level image-processing and control functions. Included are functions that improve the signal-to-noise ratio of the captured image and find edges. **Price:** \$4495; \$995 for ITEX 100 software.

Contact: Imaging Technology, Inc., 600 West Cummings Park, Woburn, MA 01801, (617) 938-8444. **Inquiry 1113.**



VS 100-AT grabs nonstandard images.

Workstation-Quality Graphics

The Artist Designer 16 MC is a 16-bit Micro Channel card for 1664- by 1200-pixel resolution for monochrome applications.

Designed by Control Systems, it supports the Direct Graphics Interface Standard developed by Graphic Software Systems through on-board firmware.

DGIS drivers support VersaCAD, AutoCAD, Page-Maker, Ventura Publisher, Lotus 1-2-3, CADvance, P-CAD, and others.

The Artist Designer 16 MC controller incorporates the Texas Instruments 34010 microprocessor, which uses display-list processing techniques for 5-MIPS RISC performance. This relieves the host CPU from complex processing tasks associated with graphics algorithms and software emulation, for example. It is especially useful in custom graphics programming, the manufacturer claims.

Operation can be either 1 bit or 2 bits per pixel, software-selectable. The display window of 4096 by 2048 pixels or 2048 by 2048 pixels is displayable memory. In the 2-bit-per-pixel operating mode, four shades of gray can be displayed, with a reso-

lution of about 150 dots per inch on a page-size monitor. **Price:** \$3995.

Contact: Control Systems, Inc., 2675 Patton Rd., St. Paul, MN 55113, (612) 631-7800.

Inquiry 1114.

Kit Transforms Your PC into a CAD System

CADPak includes everything you need to transform your PC into a CAD system, says developer GTCO Corp.

There's a CADcontroller graphics controller, an asynchronous communications adapter, a micro Digi-Pad digitizer, 1 megabyte of extended memory, and software.

The controller offers 1024- by 768-pixel or 800- by 600-pixel resolution, interlaced or noninterlaced color graphics, and a Hitachi Advanced CRT Controller.

The Micro Digi-Pad digitizer works in a 12- by 12-inch active area and includes a 4-button cursor with Binary Stylus with two barrel switches. The software disk drivers are included for AutoCAD Release 9, VersaCAD, Generic CADD, and others.

Price: \$999; \$1489 with 1 megabyte of RAM. **Contact:** GTCO Corp., 7125 Riverwood Dr., Columbia, MD 21046, (301) 381-6688. **Inquiry 1115.**

Scan Converters Enhance Graphics

The RGB/Videolink converts microcomputer video graphics to NTSC video (television) for video-taping, video projection, and video transmission. RGB previously offered scan converters designed only for workstations made by such companies as Sun and Apollo.

The Mac II-, PC- and PS/2-compatible scan converters offer 24-bit color and real-time performance as long as you have an EGA or a VGA frame buffer.

An optional RGB/Videolink Plus includes a built-in video mixer that allows you to overlay computer graphics over live video—in windows or in the background, for example.

The main feature of both RGB dedicated image processors is a proprietary filter that eliminates the flicker problem, RGB claims.

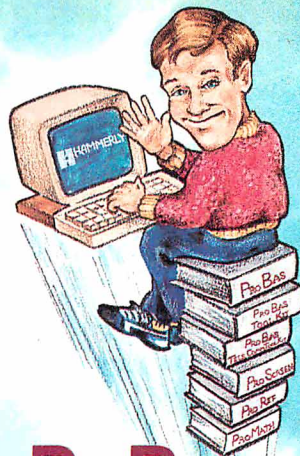
That flicker problem generally accompanies interlaced video transmission. The filter makes possible a composite television image similar to the original computer image in stability.

The RGB/Videolink accepts full-screen, noninterlaced RGB input and provides genlock, sync generation, and encoding to output the NTSC video. Complete scan conversion is accomplished in real time. The RGB/Videolink requires no software modifications, and it doesn't affect performance of the host or its RGB monitor. **Price:** \$9900; \$11,400 for the RGB/Videolink Plus. **Contact:** RGB Technology, 2550 Ninth St., Suite 114, Berkeley, CA 94710, (415) 284-4330.

Inquiry 1116.

continued

~~Six~~ Five easy ways to boost your BASIC



PROBAS™ updated Professional Basic Programming Library

Announcing **PROBAS** Version 3.0, now with over 335 assembly routines to really kick QuickBASIC and BASCOM into high gear. **BYTE** magazine calls **PROBAS** a "Super-charger for QuickBASIC". Thousands of programmers rely on **PROBAS** to make their life easier and to enhance their programs with features like:

- An 800-page 3-part manual
- Full-featured windowing
- Screen snapshots (Text & Graphics)
- String, array, and pointer sorts
- Lightning-fast file I/O
- Full mouse support

Create dazzling screens in text mode, CGA, EGA, VGA or Hercules graphic modes. Save and restore screen snapshots to arrays, EMS memory or files. Full featured windowing to meet the most demanding jobs. The **PROBAS** system of virtual screens allows you to draw full or partial screens to memory, and then snap them on in an eyeblink. You can even create virtual screens far larger than the display screen.

Sick of running out of string space? Store hundreds of K in numeric arrays or megabytes in extended or expanded memory. Tired of using a kludgy SHELL to DIR to read a directory or archive files? Scan sub-directories or .ARC files using wild-cards and store thousands of file names, dates, and times. Wish you could drag a window containing text or a menu around the screen with a mouse? It's easy!

PROBAS gives you a complete set of blazingly-fast file routines. Read or write huge chunks of data at a clip, with file locking and error handling so that you can even use them in subprograms. You'll never want to use BASIC's file I/O again! Sort data with lightning fast array and pointer sorts. Search files or arrays at assembly speeds. **PROBAS** also has over 200 other essential services including handy string, date, time, directory and array manipulation, string, screen and data compression, full mouse support, valuable equipment and input routines and faster replacements for most BASIC commands.

Whether you are a professional or a novice, **PROBAS** will boost your BASIC in ways you never dreamt possible. **PROBAS** allows professionals to save time and work and lets novices write professional-quality programs quickly and easily. After all, how much is a few hundred hours of your time really worth?

For all versions of QuickBASIC and BASCOM including BASCOM 6.0 for OS/2. **Just \$135.00!**

PROREF™ On-Line Help For PROBAS

PROREF provides pop-up help for the routines in **PROBAS** and is an extension of the QuickBASIC programming environment. Find help on any routine with a few key-strokes or mouse clicks. Pop-up an ASCII chart, calculator, scan code module, box diagram, your own help information or almost any DOS program via a hot-key. **Just \$50.00!**

PROSCREEN™ Professional Screen Management System

PROSCREEN is a full-featured screen generator/editor that will save you more design and coding time than you ever thought possible. **PROSCREEN** treats screens like a word processor treats text to provide complete control over characters, colors, and placement. Design input screens with up to 130 fields and 19 pre-defined and 2 user-defined masks. Use **PROBAS** or the included BASIC/Assembler subroutines to access the screens. No kludgy code generators here! Comes with subroutine source, extensive on-line help, and a 285 page manual. **Just \$99.00!**

PROMATH™ new!

PROMATH is a collection of over 150 high-level routines that provide mathematical functions and operations for programmers who often work in mathematics, science, or engineering. Complex variables, real and complex matrices, real and complex trigonometric and hyperbolic functions and their inverses, solution of linear equations, integration, differential equations, Fast Fourier transforms and many other useful routines are provided.

For years Fortran has been the language of choice for scientific and engineering applications, but it lacks many of the useful features of QuickBASIC. **PROMATH** contains most of the Fortran mathematical and numeric functions and allows you to easily translate Fortran code to BASIC or write new programs in BASIC while retaining Fortran's numerical prowess.

The **PROMATH** manual is over 200 pages and provides a complete description of each routine, including any algorithm and the mathematical formula the routine uses, shown in standard notation. For QuickBASIC 4 and BASCOM 6 only. **Just \$99.00!**

PROBAS™ **TOOLKIT**

The **TOOLKIT** is a collection of assembly and BASIC modules that use the **PROBAS** library to save you even more hours of grunt work. Why spend hundreds of hours re-inventing the wheel when you can just plug in **TOOLKIT** modules like:

- Menu Generators
- Fast B-tree indexing
- Mini-editor with word-wrap
- Patch .EXE files
- Protected storage areas
- Julian date routines

The **TOOLKIT** also includes clock, calendar, windowing, BCD math routines and much more, complete with BASIC source code and a comprehensive manual. The **PROBAS TOOLKIT** adds capabilities and helps conserve your most valuable asset of all—time! Requires **PROBAS**. **Just \$99.00!**

PROBAS™ **TELECOMM TOOLKIT**

The **PROBAS TELECOMM TOOLKIT** is a collection of high-level communications modules that you plug into your code to provide popular file transfer protocols, terminal emulations, login scripts and baud rates up to 115,200 baud. You get:

- Xmodem/Modem7/Xmodem-1k
- Ymodem (single and batch)
- CRC-16 and Checksum
- VT52, VT100, ANSI BBS etc.
- Auto Dialer & data base
- Documented BASIC source

Why use clumsy SHELLS to complex terminal programs when you can plug just the communications routines you need into your code? Implement just the features and commands you want. Requires **PROBAS**. **Just \$75.00!**

Our thirty day, money-back guarantee assures you the highest quality and our technical support staff is always ready to help. Try our BBS at (301) 953-7738 or give us a call at:

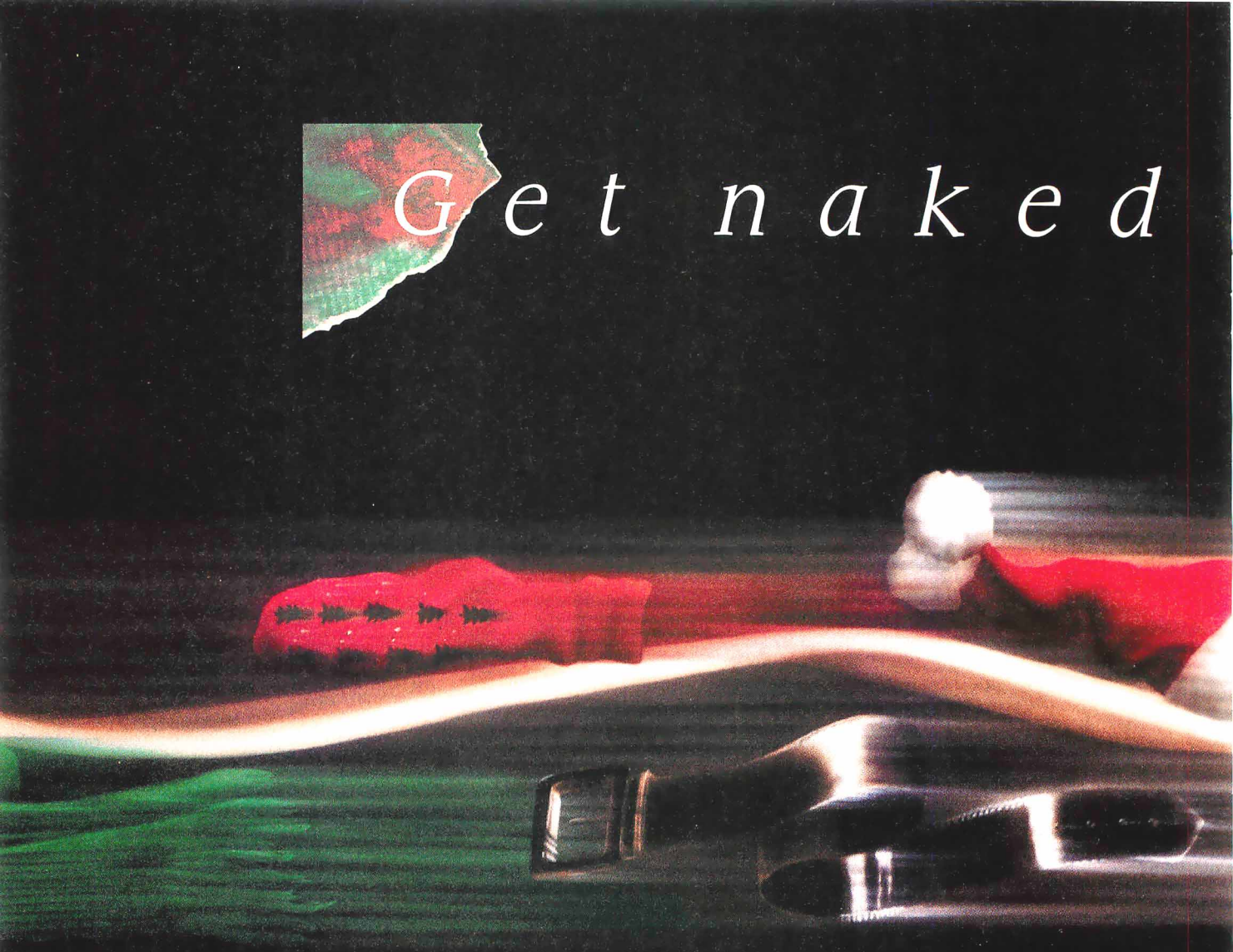
HAMMERLY
COMPUTER SERVICES, INC.

8008 SANDY SPRING ROAD • LAUREL, MD 20707
INTERNATIONAL CALLS: (301) 953-2191

(800) 343-7484

FAX # 301-725-8147

Add \$5.00 per item (\$8.00 Canada) for shipping per order. Europe: \$39.00 for 1st item plus \$5.00 for each additional item. Visa, M/C, C.O.D. (US Only) checks and approved POs accepted. Trademarks **PROBAS**, **PROREF**, **PROSCREEN**, **PROMATH**: Hammerly Computer Services, Inc. QuickBASIC, BASCOM: Microsoft Corp.



Get naked

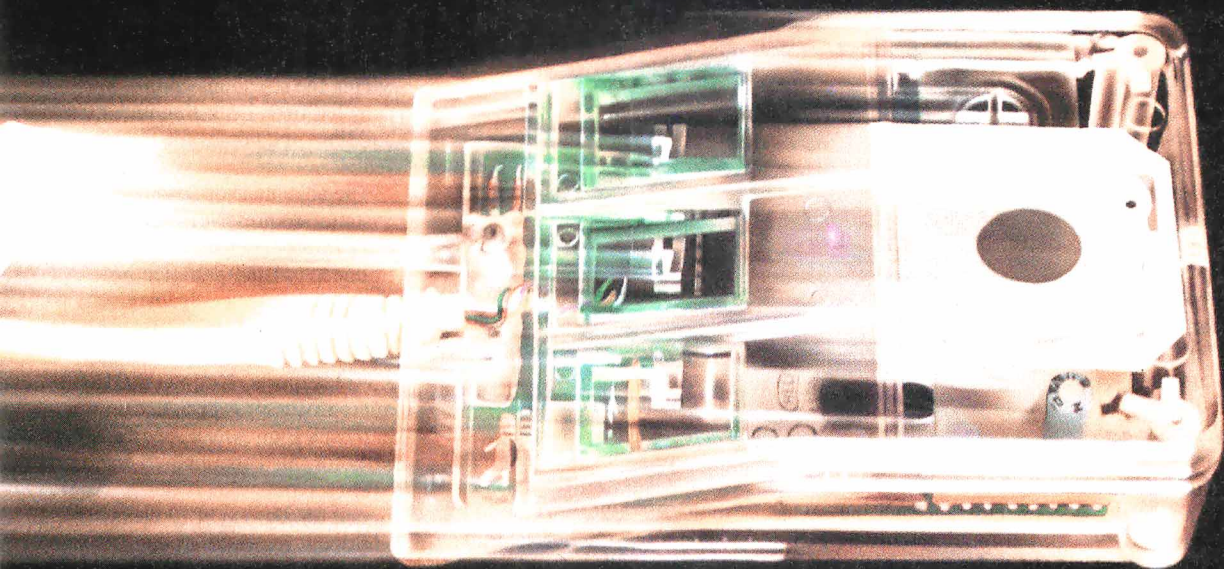
ClearCase™ Mouse—Special Edition From Logitech.

To celebrate the shipment of our two millionth mouse, we took the covers off our winning technology.

But this mouse is a lot more than just a pretty case. It's compatible with virtually all mouse-based programs, plus you can program it to "mousify" any keyboard-based application. And it doesn't need resetting when you switch programs.

High resolution, adjustable cursor control, and a programmable 9,600 baud rate let you move the cursor quickly and accurately, even on detailed graphics—perfect for applications

for Christmas.



like PaintShow™ which, it so happens, comes with your ClearCase Mouse.

You get everything for \$149. The package includes: the Logitech ClearCase Mouse for IBM PC, XT, or AT and PS/2 or 100% compatibles; a 9-25 pin adapter; Plus Package™ software; and Logitech PaintShow™ (which requires a graphics card).

*Pick up the ClearCase Mouse
at your computer dealer,
or call: 800-231-7717.
(In California call
800-552-8885.)*



LOGITECH
Personal Peripherals. Worldwide.

Circle 167 on Reader Service Card (DEALERS: 168)

Infrared Gateway Links Ethernets

Sometimes there's a river between your two Ethernet local-area networks, and sometimes there's a city street 30 floors down. Both times it's just not cost-effective to run a coaxial or fiber link.

But Laser Communications' latest product solves that problem. The LCI Lace Model L00-18 is a 10-megabit-per-second, optical transmission system that will link two Ethernet networks (at distances of up to 1 kilometer) as long as there's a clear line of sight.

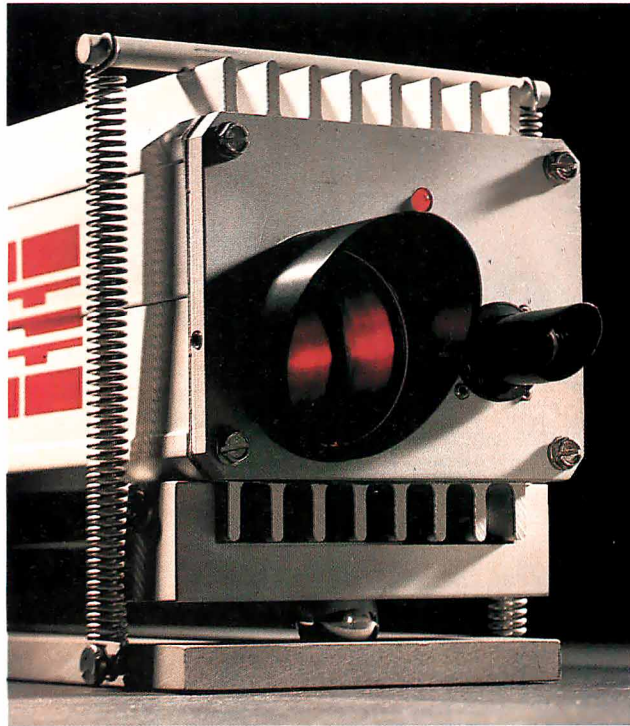
It uses a gallium arsenide semiconductor laser diode as a light source and a silicon avalanche photodetector to receive the light signal. There's no need to lay cable, no need to obtain any rights-of-way, no licensing requirement, and no need for encryption for secure transmissions.

Like optical-fiber cabling, the system is immune to electromagnetic interferences (i.e., the cable doesn't radiate and disturb other electrical equipment).

Some critics have said that LCI's previously available products, which have transmitted at the telecommunications data rate of 1.544 megabits per second or lower, haven't worked in rain, snow, or even fog. But company representatives vehemently reject this claim.

The company claims that LCI Lace is "not dependent on visual sighting ability between sites in poor weather." The company also says that the low level of power output of the lasers makes them "virtually harmless."

Each Lace uses horizontal and vertical positioning elements and visual and audio signals for aiming adjustment. Requirements are standard coaxial cabling with 15-pin D-



Infrared beams fly between Ethernets.

connectors on each end. AC power requirements are 115 volts. Each 4- by 6- by 20-inch unit weighs 10 pounds. **Price:** \$14,190.

Contact: Laser Communications, Inc., 1848 Charter Lane, Suite F, Lancaster, PA 17601, (800) 527-3740; in Pennsylvania, (717) 394-8634.

Inquiry 1117.

Low-Level Network Uses AC Lines Instead of Cabling

Carrier Current Technologies designed the CarrierNet, the CarrierNet Plus, and software for low-level networking through your power lines. It's mainly designed for peripheral sharing, where file transfer is most important.

The system transfers data through your network at 38.4K bits per second to the RS-232C port on your computer or

to the RS-232C port on the stand-alone CarrierNet Plus.

Like similar recently introduced products, the network device plugs into the nearest wall outlet. The only limitation is that networked computers and peripherals must be on the same side of a power transformer, which usually means intrabuilding communication is no problem.

CarrierNet acts as a peripheral designed for the IBM PC, XT, AT, and compatibles. CarrierNet Plus is designed to function separately, with its ability to store print commands with either 6K bytes or 1 megabyte of RAM.

Up to 16 devices can be connected with both hardware and software on this Carrier Current network, the company says.

Price: \$199 to \$219 for CarrierNet; \$395 for CarrierNet Plus; \$89 for software.

Contact: Carrier Current Technologies, Inc., 1804 West Southern Pkwy., Bldg. A-112, Durham, NC 27707, (919) 490-4970.

Inquiry 1120.

Ethernet Concentrator Features Network Management

David Systems has introduced electronics for your Ethernet LAN that work with the unshielded twisted-pair wiring the telephone company has been installing in buildings and homes for years.

The advantage of David Systems' ExpressNet network concentrator over recently introduced twisted-pair electronics products, the company says, is its provision for network management through RS-232C ports. An Intel 8031 microprocessor is designed into each ExpressNet specifically for this function.

Each ExpressNet is designed for a group of 12 users; additional ExpressNets can be purchased for adding more users up to the limit of 1024 users.

The workstations can be organized in a star network configuration using existing building wiring, with Ethernet cards in the PCs connected to the wiring with twisted-pair interface devices called TP-MAUs.

Network management can include diagnostics of packet count, collision count, and identification of links with traffic and collisions. In addition, 17 LEDs on ExpressNet and 4 LEDs on the TP-MAUs give you a visual identification of the status without a network management terminal. **Price:** \$2495 per hub; \$149 for each TP-MAU.

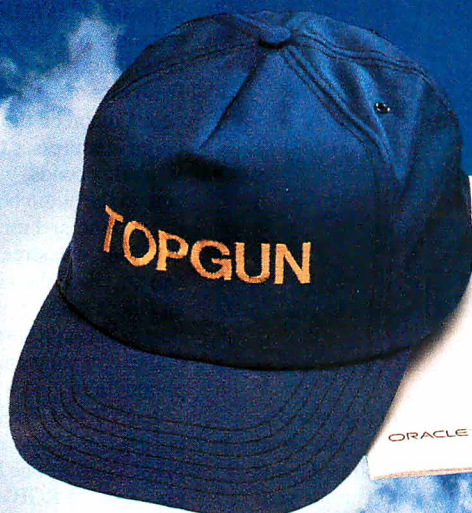
Contact: David Systems, Inc., 701 East Evelyn Ave., Sunnyvale, CA 94086, (408) 720-8000.

Inquiry 1119.

continued

SQL Top Gun School

\$199



All the database Top Guns are flying SQL, the industry-standard data management language first delivered by Oracle. Why? Because one SQL statement replaces up to 20 lines of dBASE code. And because all the powerful multi-user and distributed databases use SQL — exclusively.

Now you can turn your PC into a SQL trainer that will make you a database top gun: Introducing SQL*Tutor from Oracle, only \$199.

Become an instant SQL ace.

After using SQL*Tutor, you'll be able to:

- Construct simple and complex queries
- Create tables, views and indexes
- Manipulate information in data tables
- Create reports
- Use ORACLE's powerful SQL extensions

Or if you're already sold on SQL, then order Professional ORACLE today for \$1295,* and get SQL*Tutor free.

According to PC Week, Professional ORACLE is "the most versatile database management system available on the PC." It includes the ORACLE

SQL database engine, utilities and Oracle's 4th-generation application development tools.

Professional ORACLE is network-ready, and is the same ORACLE that

runs on minis and mainframes. Use it as your standard PC workgroup database, and to provide connectivity to corporate data.

Call 1-800-ORACLE1, ext. 4909 today. Or fill out and AIR MAIL the attached coupon. So your squadron can fly the latest database technology into the 1990s.

Dear ORACLE...

PC Marketing • 20 Davis Drive • Belmont, CA 94002
1-800-ORACLE1, ext. 4909

Enclosed is my ☐ check or ☐ VISA ☐ MC
☐ AMEX credit card number and authorization
for (check only one):

☐ \$199 for online SQL*Tutor and *Introduction to SQL* so I can start developing in SQL.

☐ \$1295 for Professional ORACLE, which includes SQL*Tutor.

\$_____ Please add appropriate sales tax.

\$_____ **Total.** I understand Oracle pays shipping, and this offer is valid in the U.S. only.

NAME _____

TITLE _____

COMPANY _____

STREET (no P.O. boxes, please) _____

CITY _____

STATE _____ ZIP _____

PHONE _____

CREDIT CARD NO. _____ CARD EXPIRATION DATE _____

SIGNATURE _____ TODAY'S DATE _____ BYTE _____

Lost that Lovin' Feeling for dBASE?

Everybody has. And now, they're learning SQL. SQL*Tutor is the perfect way to get ready for the emerging SQL database world. Use it to introduce SQL to your entire organization, to offer SQL refresher courses, or as a supplement to documentation.

ORACLE®

COMPATIBILITY • PORTABILITY • CONNECTABILITY

Call 1-800-ORACLE1, ext. 4909 today.

Copyright © 1988 by Oracle Corporation.
ORACLE is a registered trademark of Oracle Corporation.
dBASE is a trademark of Ashton-Tate.
*Requires an 80286/80386 PC with 640KB RAM plus
1 MB of extended memory, running DOS 3.0+. TRBA

20 Davis Drive, Belmont, CA 94002 • World Headquarters
(415) 598-8000 • Calgary (403) 265-2622 • Ottawa (613) 238-2381 •
Quebec (514) 337-0755 • Toronto (416) 596-7750 • ORACLE Systems
Australia (61-2) 359-5080 • ORACLE Europe 44-1-948-6911 •
ORACLE Systems Hong Kong 852-5-266846

A Window on Processor Activity

Secant Corp. has a device for observing processor activity on any IBM PC, XT, or AT compatible.

The PCM displays all 20 address lines of the PC, XT, or compatible system bus or the most significant 20 address lines of the AT bus. Also displayed are the eight data bus lines and the I/O read and write control signals.

Sixteen of the LEDs on the panel can be turned on or off under program control, and the settings of sixteen toggle switches can likewise be read under program control.

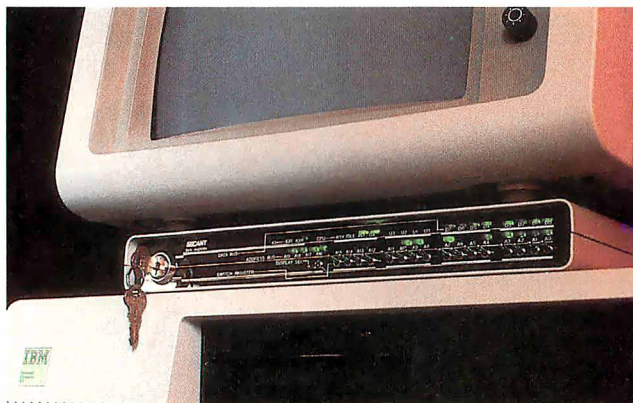
Because the memory bus address lines are displayed in a row of 20 LEDs, the current address of the executing program is always visible as a pattern of lights of varying intensity; thus, it can provide a good indication of program activity. That is, it gives an indication of whether the program is performing I/O, waiting on I/O, has died in the loop, or is executing normally.

Data acquisition and process control applications can use the 16 LED's for annunciating events appropriate to their applications.

The product includes source code to Hilite, a performance monitoring program. When the Hilite program is running as the lowest-priority task under any multiprocessing operating system, it uses the LED register as a horizontal bar graph that indicates the instantaneous percentage of processor cycles being used and the percentage of processor capacity still available. **Price:** \$349; \$295 without switch registers.

Contact: Secant Corp., P.O. Box 7000-733, Redondo Beach, CA 90277, (213) 378-7779.

Inquiry 1125.



Beta version of Secant's CPU window.

Videoconferencing Reaches the PC

Affordable full-motion videoconferencing between personal computers is now available from Concept Communications. You simply add a full-length IBM PC XT- or AT-compatible video processor board and an optional full-length audio processor board to your PC, hook up video cameras, and you're set to go.

From one of the long distance carriers or your local telephone company (depending on what two points you need conferencing), you can purchase a "Switched 56" kilobit-per-second digital line. Or you can go through one of the satellite-transmission services and purchase digital transmission at up to 384K bps—much better quality if your subjects need to be seen moving around, for example. But 56K is sufficient for board meetings, company officials are quick to add.

Image 30 is full-motion in the same way television today is full-motion—with a refresh rate of 30 frames per second. Silicon on the video board compresses the video in 10 milliseconds, while silicon on the audio board digitizes sound and mixes it into the video datastream. Or you can purchase the video board and use a speaker phone connected through standard telephone company analog telephone lines.

Each board features four ports—one NTSC input, one NTSC output, one RGB input, and one RGB output. In each of these ports, you can support peripherals such as video cassette recorders and video printers.

Price: \$12,000 for video card; \$2000 for audio card. **Contact:** Concept Communications, Inc., Infomart, 1950 Stemmons Freeway, Suite 4038, Dallas, TX 75207, (214) 746-3888.

Inquiry 1122.

continued

Document Reader Could Lower Cost of Optical Scanning

Calera Recognition Systems is offering a system that the company says significantly lowers the cost of scanning printed text and graphics into a computer and using that material in an application program.

The TrueScan document recognition system consists of an IBM PC-compatible add-on board and software that works with most low-cost (\$1000 or less) optical scanners. Calera says it is capable of reading most fonts and maintaining formats.

TrueScan processes whatever document you have loaded into the scanner and allows you to convert it to a host of word processing, spreadsheet, or graphics file formats (including TIFF, PC Paintbrush, PCX, and

CCITT Group IV for fax images). TrueScan can recognize boldface, italics, underlines, and other text attributes and convert these to the host word processor's formatting codes.

You feed the document into the scanner and choose the appropriate word processing, spreadsheet, or graphics file format. TrueScan saves the scanned document as a file on disk that you can then load into your software package. While processing speed varies depending on the complexity of the document, a typical page of text takes about 45 seconds to convert.

Using proprietary document-recognition algorithms, TrueScan can recognize virtually any printed

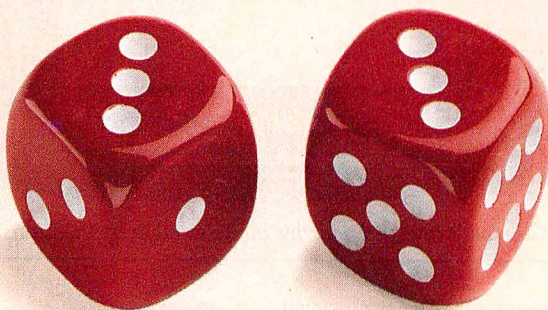
font from typewritten to typeset, the company says. The algorithms "go beyond the limitations of matrix matching and feature extraction. They work on a statistical basis of certainty to identify individual characters, as well as other page attributes," says the company.

The basic system has 2 megabytes of RAM and scans documents at a speed of about 70 characters per second. A premium system with 4 megabytes of RAM is rated at a speed of 100 cps.

Price: \$2495 with 2 megabytes of RAM; \$3495 with 4 megabytes.

Contact: Calera Recognition Systems, Inc., 2500 Augustine Dr., Santa Clara, CA 95054, (408) 986-8006. **Inquiry 1121.**

6 ways Genoa takes the gamble out of data backup.



It isn't the hardware or the software, it's the data that's the most valuable part of your personal computer. The hundreds of hours spent creating and editing data, plus its inherent value to your operation, make it priceless.

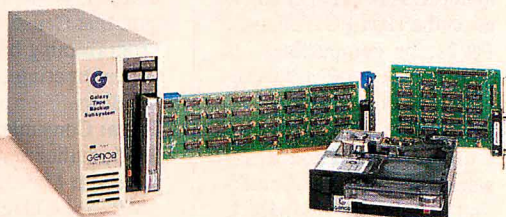
Protect that expensive data with a dependable backup system. Only Genoa's Galaxy family of tape backup systems offers 6 high-performance advantages in data protection.

1. On-Line

Galaxy software provides on-line network support. Galaxy and Galaxy/MC tape backup systems come with Genoa's Novell Advanced Network 86 or 286 compatible software driver, a \$200.00 value, *free!*

2. Fast

At 5MB a minute, Galaxy systems are among the fastest tape backups around. You can back up the whole data file in just a few minutes.



Pictured are our internal and external cartridge backups for IBM PC/XT/ATs.

3. Easy

Simple command menus make Galaxy systems so easy to operate, most users can start backing up data within minutes.

4. Automatic

Never again will you worry about forgetting to back up data. Galaxy's autoscheduler feature lets you preset an exact date and time, then it *automatically* does the backup for you.

5. Reliable

Galaxy boasts one of the lowest return rates in the industry. Plus a full year warranty.

6. IBM Compatible

Galaxy works with all IBM PCs and compatibles, including the new Micro

Channel. For the PC/XT/AT, there are external and internal models. Both are available in cassette and cartridge versions. We also offer a SlimBox model for the PC/XT/AT. It's an efficiently sized external cassette system.



The Galaxy Micro Channel family makes it possible to exchange data between IBM PC/XT/ATs and PS/2 models 50, 60 and 80.

For the Galaxy dealer nearest you, contact Genoa, 75 E. Trimble Rd., San Jose, CA 95131. Fax: (408)

434-0997. Telex: 172319. Phone: (408) 432-9090. Or fill out the coupon below, we'll send you more information. You've got nothing to lose—except the most valuable part of your personal computer.



I want to protect my investment in data!

Please send me more information on Galaxy tape backup subsystems.

Name _____
Title _____
Company _____
Address _____
City _____ State _____ Zip _____
Phone (_____) _____ Ext. _____

Please check all that apply: ☐ PC ☐ XT ☐ AT
☐ PS/2, Model 50 ☐ PS/2, Model 60 ☐ PS/2, Model 80

Mail to: Geri Scheer, Genoa Systems Corporation,
75 E. Trimble Rd., San Jose, CA 95131

A Clarion Call for Nonprogrammers

Yet another easy-to-use custom application generator comes from Clarion Software, best known for its Clarion database package. You might think of the Clarion Personal Developer (CPD) as the smaller (and less expensive) sibling of the company's still-available Clarion Professional Developer.

According to the company, you don't need any coding experience or special technical knowledge to create eye-popping programs with sophisticated features. You can routinely include features such as point-and-shoot menus, scrolling data tables, pop-up data-entry forms, lookups, computed fields, and hot-key procedures. And Clarion doesn't require you to purchase a license if you want to copy and distribute your custom applications to others.

The CPD comes with eight ready-to-run applications that you can use as-is or modify. Once you think you've gone beyond the CPD's capabilities, you can use Clarion's Professional Developer package to enhance CPD-developed



Clarion's low-end package includes eight applications.

programs. The professional package lets you add complex application code, C or assembly language, local-area-network support, and advanced file management such as transaction processing and file encryption.

To use the CPD, you'll need an IBM PC, XT, AT, PS/2, or compatible with 512K bytes of RAM (640K bytes is recommended), a floppy disk drive, and a hard disk drive. The CPD runs on MS-DOS 2.1 or higher.

Price: \$169.

Contact: Clarion Software Corp., 150 East Sample Rd., Pompano Beach, FL 33064, (305) 785-4555.

Inquiry 1128.

Layout Makes the CASE

Matrix Software calls its newest software contribution Matrix Layout, describing it as a CASE (computer-aided software engineering) tool for users of the IBM PC, XT, PS/2s, and compatibles.

Using Layout to create a custom application involves several steps, the first of which is creating an on-screen graphic flowchart. You then interactively design programming objects, such as files, graphics, and variables. After you're done, Layout does its

thing by creating the program in your choice of Turbo Pascal, Microsoft C, Turbo C, Lattice C, or QuickBASIC. You can also have Layout create an executable (.EXE) file.

Layout also comes with Matrix Paint (a paint package), Matrix Helpmaker (a hypertext-based help program), and Matrix Desktop, a DOS utility that works with files and disks.

Price: \$149.95.

Contact: Matrix Software Technology Corp., One Massachusetts Technology Center, Harborside Dr., Boston, MA 02128, (800) 533-5644; in Massachusetts, (617) 567-0037.

Inquiry 1126.

Cause and Effect

In an industry filled with acronyms, Cause surprisingly isn't one. But it is the name of a software package that Maxem calls a visual and intuitive programming environment. With Cause, you use a mouse, graphics, icons, windows, and color to create your own custom applications for either the PC or the Macintosh.

With Cause, you don't need to learn a programming language and the associated syntax. In fact, the company claims you can create an entire application without having to touch the keyboard except to type in labels for windows and data. A B-tree/ISAM database is the underlying engine that Cause uses. Cause programming basically involves creating a series of windows.

Price: Consumer version, \$495; author version, \$595.

Contact: Maxem Corp., 1550 East University Dr., Mesa, AZ 85203, (602) 827-8181.

Inquiry 1127.

continued

Evertrak Tracks Your Programs

If you're a professional programmer who makes your living off the software you develop and sell, the thorny problem of keeping track of the number of copies out in the field and avoiding "sharing" is one that can keep you awake nights. How do you control distribution without using copy protection? Evertrak from Az-Tech Software can help.

As its name implies, Evertrak can keep track of your software. Among its features are its ability to

thwart reverse-engineering by keeping your program from being disassembled or run under a debug system. It also lets you place a secure alphanumeric serial-number string in your program. The company claims this 60-character string is totally secure from hackers.

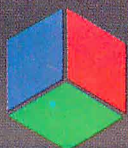
Evertrak can also build an expiration date into your program that will limit the amount of time it can be used. It can also restrict the type of media your program will operate on.

You don't need to make any changes in your source code to use Evertrak. The company says it will work with any program that runs under MS-DOS 2.0 or higher on the IBM PC, XT, AT, PS/2s, or compatibles. It also comes with a 30-day money-back guarantee.

Price: \$295.

Contact: Az-Tech Software, Inc., 305 East Franklin, Richmond, MO 64085, (800) 227-0644; in Missouri, (816) 776-2700.

Inquiry 1129.



CTX

Presents

14" VGA MONITOR

CTX-2431



14" MULTISCAN COLOR MONITOR

CTX-3435



CTX, already rated "Best Buy" by PC Digest and PC World for their multiscan and monochrome monitors, now presents its NEW 14" Multiscan and VGA monitors.

The new CTX-3435 Multiscan monitor features a 14" diagonal non-glare CRT. The unit rests on a newly developed detachable swivel-tilt base designed for greater versatility and convenience. This monitor's wide range of compatibility includes Apple MacII and Commodore Amiga as well as CGA, EGA, MDA, and VGA video cards.

The new VGA monitor, with its 30 MHz band width, is compatible with all VGA cards on the market today. Availability is in both monochrome and color, each offering resolutions of 720x480, 720x400, or 720x350.

For more information on these new CTX monitors and other high quality CTX products please contact our new headquarters at:

CTX INTERNATIONAL, INC.

161 Commerce Way
Walnut, CA 91789

TEL: (714) 595-6146 • FAX: (714) 595-6293

EASTERN REGIONAL OFFICE

CONTINENTAL TECHNOLOGY, INC.

300 McGAW DRIVE
EDISON, NEW JERSEY 08837
TEL: (201) 225-7377 FAX: (201) 225-6355

FACTORY

CHUNTEX ELECTRONIC CO., LTD.
ROOM 401, NO. 50 SEC. 1,
HSIN-SHENG S. RD.,
TAIPEI, TAIWAN, R.O.C.
TEL: (02) 3921171 FAX: (02) 3919780

Apple MacII is a registered trademark of Apple Computer, Inc.
Amiga is a registered trademark of Commodore-Amiga.

EVERYBODY

But they're not all switching to the database management system you might expect.

In a recent industry survey,* two-thirds of the respondents who intended to buy a DBMS did not intend to buy dBASE.

And, perhaps coincidentally, two-thirds of recent R:BASE® buyers have used another DBMS before.

Why are they switching to R:BASE?

Because nobody really needs a DBMS: they only need what a DBMS can do.

And users find that the friendly facade of other software is fine for questions. But R:BASE has the right answers for their information management needs.

With R:BASE, you can handle all your data management (not just queries) without learning a single command. Our Prompt By Example (PBE) lets you point-and-pick, then R:BASE does the work.

When you find that you're repeating yourself, you automate simply by recording your actions in a macro file.

Or use our application generator to quickly create complete, correct business programs without touching a line of program code.



Data is data, but information is power.

R:BASE gives you that power. And even impartial judges seem to agree: *PC Magazine*, *Software Digest*, *Datapro* and *InfoWorld* all just gave

IS DOING IT.

R:BASE their highest marks.

Because to its ease-of-use, R:BASE adds speed, functionality and data integrity in a combination you don't get with dBASE, Paradox, DataEase, Oracle or any of the other contenders.

R:BASE is optimized for speed, with an intermediate code compiler that makes your applications sing. And a true compiler is on its way.

You can use its English-based language in command mode, to modify programs R:BASE writes for you, or to write your own solutions from scratch.

Simple menus, prompts and our "paint-the-screen" techniques make sophisticated screens, forms and reports quick and easy to create. With R:BASE forms, you can view and update data from several tables at the same time. Create

computed fields. Include scrolling regions so you can work with all the data from other tables. Add rules for data integrity.

And R:BASE is relational, so your rules stay with the tables—applications can't avoid or change them. And forms can be set up to cascade changes through related tables. So you can trust the information you get.

We also give you an SQL implementation that even novices can use to create simple yet powerful queries.



**Software
Digest**

datapro

**INFO
WORLD**

And networking is free for up to three users. It's also easy, so any single-user application can be run on a multi-user LAN with a single command. And our advanced concurrency control, unlike earlier-generation auto-refresh in other DBMSs, won't bring your network to its knees when you expand with our Six-Pack or Network Unlimited versions.

**Applications that just
won't quit.**

R:BASE is the second-largest selling PC DBMS in the world, and it's backed by all the training, service and third-party support you'll ever need.

It's providing end-users with the information they need in large businesses and small. On stand-alone PCs and in networks sharing data with minis and mainframes. In insurance and real estate companies, factories and universities, government offices and the storefront down the street.

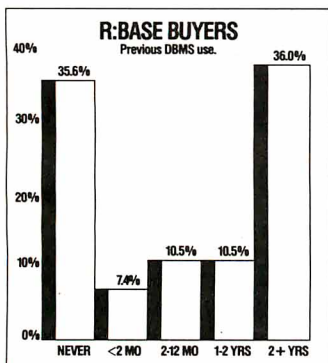
Check out what R:BASE can do for you with your local dealer, or write: Microrim, Inc., P.O. Box 97022, Redmond, WA 98073-9722.

DO IT.



Call 1-800-624-0810 today.

*Computer & Software News, 9/5/88. Microrim and R:BASE are trademarks of Microrim, Inc. Other products and services mentioned are not. © Microrim, Inc. 1988.



Complete Chromatography Control

Axxion says you can install its Model 747-993 Chromatography Data System Kit in any IBM PC, XT, AT, PS/2, or compatible in less than 10 minutes. Besides the software, the kit includes a custom A/D board and gives you full operational control of up to three HPLC, GC, SFC, or CZE systems.

Using auto-integration software or peak integration parameters, the package lets you store up to 150 user-definable manual or batch methods in memory. While you're conducting new analyses, you can edit or recalibrate the prior completed runs that the software stores on disk.

You access the Chromatography Data System Kit with a hot key. With an EGA card and monitor, the system can display high-resolution real-time chromatographic data from up to six detectors.

Axxion also offers an optional pump interface board that gives you HPLC gradient control for up to six pumps in binary or ternary configurations.

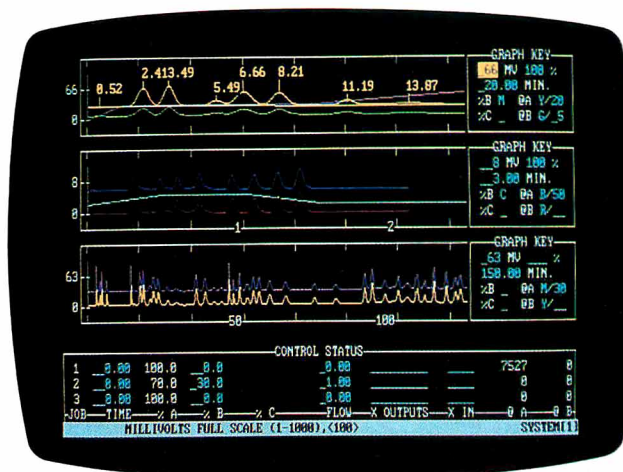
Price: \$9600.

Contact: Axxion Chromatography, 23966 Craftsman Rd., Calabasas, CA 91302, (818) 346-1800.

Inquiry 1134.

Take an Active Role in Filter Design

The newest release of Active Filter Design software from RLM Research can now perform sensitivity and worst-case analysis of the filter circuits that you've designed. AFD lets you design Butterworth, elliptic, Chebyshev, and Bessel low-pass, high-pass, band-pass, band-



The Chromatography Data System displays data in real time.

stop, and all-pass active filters. It also lets you directly enter pole and zero locations, or transfer functions. The package can convert low-pass prototype poles and zeros to your filter configuration.

AFD is menu driven, and RLM says it's designed to be easy to use no matter what your experience level. The program supports manual or automatic pole/zero pairing as well as uneven gain distributions. You'll also find active implementations of type MFB, VCVS, biquad, state variable, and Reticon or National MF-10 switched capacitor filters.

Once you've entered your data, you can output filter descriptions, pole/zero locations, transfer functions, and component locations, as well as amplitude, phase, and group delay frequency response of the entire filter or of individual sections. There's also a graphics facility that lets you analyze impulse and step response.

Price: \$725.

Contact: RLM Research, P.O. Box 3630, Boulder, CO 80307, (303) 499-7566.

Inquiry 1131.

MathEdit Makes Your Equations Visible

The limited number of characters available in most word processors can put a severe cramp into your style if you need to put complex math equations into a document. But help is on the way

from K-Talk Communications, whose MathEdit package lets you construct even the most complex math equations for insertion into your documents.

MathEdit can output equations in two formats: WordPerfect 5.0 for printing with an Apple LaserWriter, or T_EX for typesetting use. Its makers say MathEdit has a particularly user-friendly interface that walks you through the process.

The program has a display window that lets you view the equations as you create them. An EGA- or Hercules-compatible card is recommended for optimal on-screen viewing.

MathEdit runs on the IBM PC, XT, AT, PS/2s, and compatibles and requires 256K bytes of RAM and MS-DOS 2.1 or higher.

Price: \$149.

Contact: K-Talk Communications, 50 McMillen Ave., Suite 100, Columbus, OH 43201, (614) 294-3535.

Inquiry 1133.

continued

Making Order Out of Chaos

Nonlinear systems and chaos are hot topics today, and if you're a mathematician, scientist, or amateur who's interested in learning more, Dynamical Software is your ticket to the nonlinear world. It comes in two flavors, with Dynamical Software I.4 getting things started. It includes an Adams Type Integrator with noise addition, two-dimensional and three-dimensional plotting, next amplitude, time-one and circle maps, and time-series embedding.

Dynamical Software II.2 takes you a step further: It includes a Runge-Kutta integrator, a delay-differential equation integrator, phase portraits, bifurcation diagrams, spectral analysis, and fractal dimensions.

Both versions use a com-

mon file format, so the output of one can serve as the input for another. There are also standard shell scripts for automatic compilation and linking of external subroutines. To enter the world of chaos you'll need an IBM PC, XT, AT, PS/2, or compatible with 640K bytes of RAM and a graphics card. A hard disk drive, mouse, and math coprocessor are recommended, but not required. If you'll be linking user-defined subroutines, you'll also need the Microsoft FORTRAN compiler.

Price: I.4, \$250; II.2, \$350; both packages, \$550; manuals, \$25; demo disk, \$10.

Contact: Dynamical Systems, Inc., P.O. Box 35241, Tucson, AZ 85740, (602) 825-1331.

Inquiry 1132.

WordPerfect 5.0 Users...Choose Sides

WORDPERFECT 5.0 DISPLAYS MULTIPLE

These Characters Are Shown

Boldface and underline look fine, but

Does your Italics look like this

Before, you couldn't tell whether

An outline font is good for titles,

It is important to be able to tell

And Small caps and double underline

Redline is designed to

When you want to display different

YOU USED TO HAVE TO GUESS, BUT

FONTS USING HERCULES RAMFONT CARDS

WHILE WRITING AND EDITING.

what about all the other possibilities?

or can you really see italics?

you had typed subscript or superscript.

only RamFont lets you display outline.

~~strikethrough~~ from underline.

Do Not Have To Be so confusing.

help you **see changes**.

character sizes: Ee Ee Ee Ee Ee Ee

NOW YOU CAN SEE WHAT YOU MEAN.

Doc 1 Pg 1 Ln 1" Pos 1"

Without Hercules RamFont

Only Hercules video cards with RamFont allow WordPerfect 5.0 users to display multiple type styles and attributes while writing and editing. No other video cards offer these advanced capabilities. Add Hercules graphics for WordPerfect's new page preview and you've got the best display anywhere for WordPerfect 5.0.

Hercules RamFont and graphics are available only on the Hercules family of video cards: The Hercules Graphics Card Plus, monochrome video with a parallel port. The Hercules Network Card Plus, monochrome video with a TOPS

With Hercules RamFont

"FlashCard" compatible network port. And the Hercules InColor Card, featuring the Hercules graphics and RamFont modes in 16 colors.

Improve your system where you'll see it the most—on-screen. Hercules, the inexpensive upgrade.

For more information about how Hercules improves WordPerfect 5.0 and other favorite programs, call toll-free 1-800-532-0600, ext. 921 (U.S.) or 1-800-323-0601, ext. 922 (Canada).

Circle 127 on Reader Service Card
(DEALERS: 128)



Hercules.

The RamFont Advantage.

© Copyright 1988 Hercules Computer Technology, Inc., 921 Parker St., Berkeley, CA 94710. Hercules, InColor, and RamFont are trademarks of Hercules Computer Technology, Inc. All other product names are trademarks of their respective owners. Technical Support 415-540-0749, Sales 415-540-0212.

Hercules RamFont
is the perfect gift
for the 5.0 user
you know.

Xerox Upgrades Ventura

Xerox is shipping what it's calling a "new generation" of Ventura Publisher. Version 2.0 has more than 70 new features that offer increased functionality and greater ease of use. The company is also offering a Professional Extension package and a Network Server package.

Documents you've developed on version 1.1 are upward-compatible to version 2.0. Among the new features are more than 250 context-sensitive help screens in dialog boxes, a combination of pull-down or pop-up menus, and increased mouse functionality.

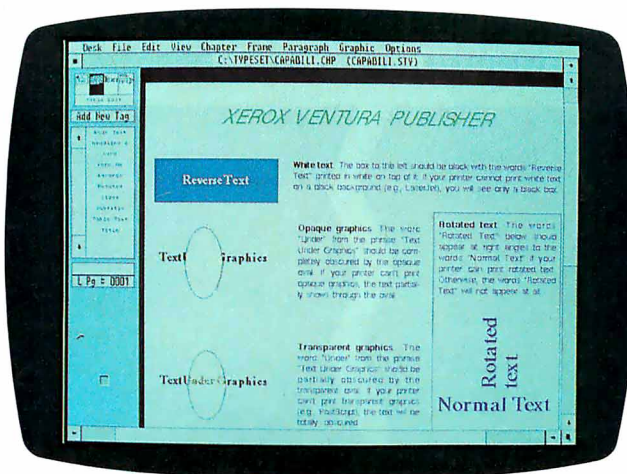
There's also increased image support and color controls, new pagination and page makeup tools, typography features such as discretionary hyphenation, more font control, and increased printer support.

Ventura Publisher's Professional Extension package is designed to help you if you're creating more sophisticated documents such as contracts, manuals, and technical documentation.

The package has expanded memory support for long documents and densely packed pages such as directories and catalogs.

Professional Extension provides complete WYSIWYG generation of equations. It also has a cross-reference feature that lets you mark locations for later insertion of chapter and page numbers, as well as figures and tables.

If you generate documents in an installation where there are multiple contributors, the Network Server supports 3Com, Novell, and PC Lan local-area networks. And with the Network Server, you can configure Ventura Publisher to accommodate individual re-



Ventura Publisher 2.0 has over 70 new features.

quirements and preferences such as screen fonts and printer drivers.
Price: \$895; upgrade from 1.0 or 1.1, \$100; Professional Extension, \$595; Network Server with Ventura Publisher, \$1295.

Contact: Xerox Corp., P.O. Box 24, Rochester, NY 14692, (800) 832-6979, ext. 121E.
Inquiry 1161.

Point and Shoot 1-2-3

Chances are that just about anything you'd like to do with a 1-2-3 macro can be found in 101 Macros Plus for Lotus 1-2-3, the latest incarnation of Individual Software's macro series for popu-

lar application packages.

The new package offers you a complete new organization, an instant macro locator, a cherry-picking facility for gathering selected macros into a separate file, and a new point-and-shoot method of accessing macros through a pop-up list of macro "short names."

Among the more than 30 new macros added to the collection are routines that allow you to calculate the median of a column of numbers, create organizational charts, print out check amounts in words, and calculate loans.

Price: \$69.95.

Contact: Individual Software, Inc., 125 Shoreway Rd., Suite 3000, San Carlos, CA 94070, (800) 331-3313; in California, (415) 595-8855.
Inquiry 1147.

Word Does Windows

The developers and major proponents of Windows have finally released a word processing package that's specifically tuned for Windows' graphic interface. It's called Microsoft Word for Windows (WfW), and it offers all the features of Word's non-Windows sibling, plus lots more.

WfW takes advantage of Windows' advanced graphics by giving you a full WYSIWYG view of your document along with full editing features.

To use WfW, you'll need an IBM AT, PS/2, or compatible, Windows 2.0 or higher, and MS-DOS 3.0 or higher.
Price: \$495; network node package, \$250; upgrade from any version of Word, \$125.
Contact: Microsoft Corp., 16011 Northeast 36th St., P.O. Box 97017, Redmond, WA 98073, (800) 426-9400; in Washington, (206) 882-8080.
Inquiry 1149.

Editing Gets Groupware

Editing and reviewing documents, be they proposals, reports, or manuscripts, is a process that usually requires the input of a group of people. According to Mainstay, that makes it notoriously painstaking and time-consuming. So the company has entered the fast-growing "groupware" market with MarkUp for the Macintosh.

If you're one of the many folks who need to comment on a document, you can use MarkUp to mark, highlight, expand, and annotate reports, spreadsheets, drawings, art, scanned photos, or other types of documents.

MarkUp is based on the metaphor of marking a transparent overlay on the original document. The pro-

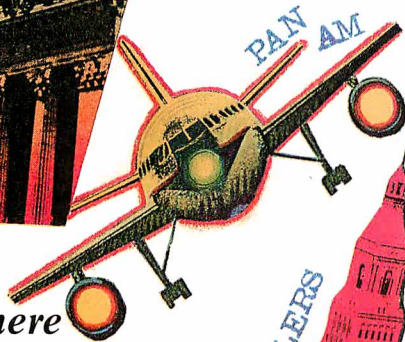
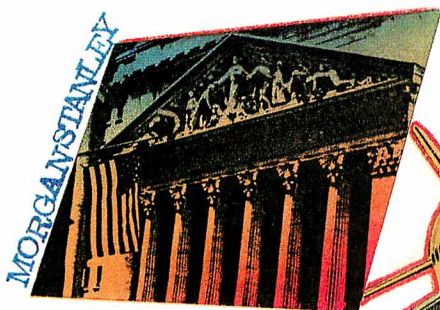
gram's print driver produces an image of the original document that you load into a multiuser database. Each group member gets a set of tools for working with the document, including a text tool, a note tool for pop-up notes, a highlighter, and tools for lines, arrows, and rectangles, as well as a lasso.

The program can support a physical workgroup on a network like AppleShare, as well as a logical workgroup where the members are dispersed and trade their files via disks or telecommunications.

Price: 2-user pack, \$495; 5-user pack, \$995; supplemental user packs, \$195 each.
Contact: Mainstay, 5311-B Derry Ave., Agoura Hills, CA 91301, (818) 991-6540.
Inquiry 1146.

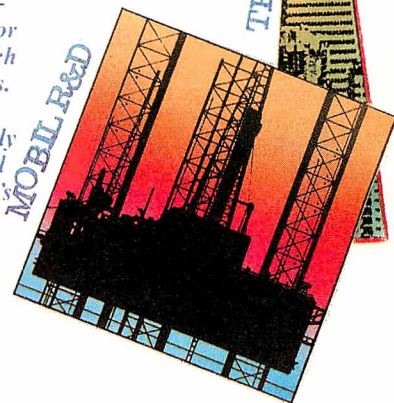
continued

95% of the Top U.S. Companies Solve Their Complex Numeric Problems with APL ...Shouldn't You?



APL is indispensable in developing mathematical models for pricing financial securities such as options, futures, and bonds. Complex mathematical algorithms are programmed quickly and concisely. And, empirical research is facilitated by APL's unmatched capabilities in manipulating and analyzing arrays of data.

Mark Schroder
Option Research Specialist
Prudential Bache



In businesses where complex numeric problems are a daily challenge, professionals from all walks of life rely on APL★PLUS®.

Thousands of professionals in a wide range of fields—investment research, insurance, corporate finance, engineering, and science—find APL★PLUS the perfect software for complex problem solving. That's because its natural mathematical orientation and concise code provide the ideal environment for model building, array handling, system prototyping, and matrix manipulation.

Many of our technical professionals are fluent in the use of APL. For us, APL's combination of power, and expressiveness makes it the perfect tool for analysis and visualization of experimental data as well as scientific and engineering computations.

Frederick J. Krambeck
Manager, Process
Development
Mobil Research and
Development Corporation

STSC

STSC, Inc.
2115 East Jefferson Street
Rockville, Maryland 20852
800-592-0050
301-984-5123 in Maryland or
Canada
Telex 898085

Why not give yourself the analytical edge, for only \$695*. Call 800-592-0050 and we'll show you how to put APL★PLUS to work in your specific application.

The APL★PLUS System is available for the mainframe, IBM PC and compatibles, Macintosh, and machines running UNIX and VAX/VMS. The APL★PLUS System may be purchased through dealers and distributors worldwide.

APL★PLUS is a registered trademark of STSC, Inc. UNIX, Macintosh, and IBM are registered trademarks of AT&T Bell Laboratories, Apple Computer, and International Business Machines Corporation, respectively.

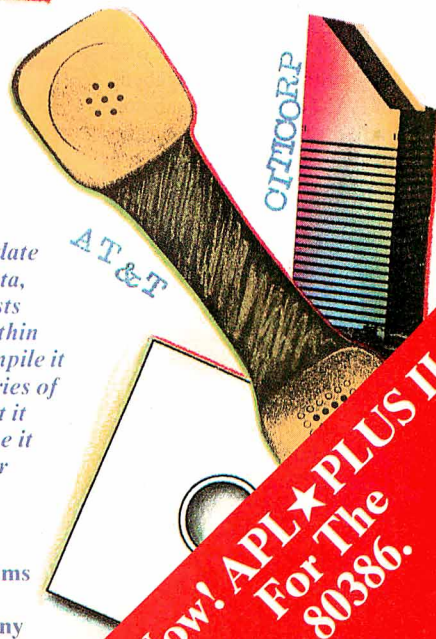
Top companies according to the April 17, 1987 issue of *Business Week*.

*U.S. suggested retail for DOS version. International prices slightly higher.

Circle 267 on Reader Service Card

When you need to consider three classes of service, numerous fare types, and multiple connections, fare pricing analysis without APL is a Herculean task. APL's ability to manipulate tables of data with a single command enables us to explore a wider range of scenarios as fast as we can think of them.

Mike Fisher
Manager, Systems
Development
Pan American World Airways



Each quarter we consolidate and analyze historical data, current data, and forecasts from over 800 entities within GE and then quickly compile it into a comprehensive series of reports. With APL we get it done in a third of the time it would take us using other methods.

Eric Baelen
Manager, Business Systems
Development
General Electric Company

**Now! APL★PLUS II
For The
80386.**

SBT Goes to the Macs

Small Business Technology Corp., best known for its wide range of accounting software for MS-DOS and Unix, has entered the territory of the Macintosh with the first of its Series Six Plus/Mac products. SBT has started the ball rolling with general ledger, inventory/accounts receivable, and accounts payable packages.

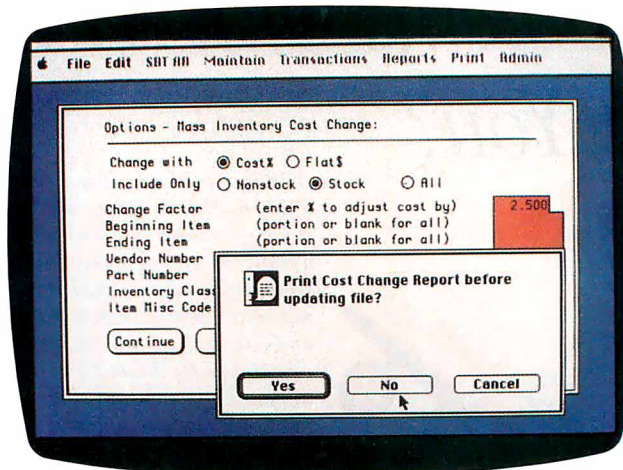
The company claims the products, created with Fox-BASE +/Mac, take full advantage of the Mac's menu and window control, typeface-selection, and screen management capabilities. Because the packages are built on a relational database structure, you get quick access to key information and can easily modify data or look at areas that share common data.

The modules, whose names are dLedger, dInvoice/dStatements, and dPayables, support up to 99 companies, with up to 999 departments per company. Besides being backed by a 5-year warranty, there's multilevel password protection and a variety of report formats.

Series Six Plus/Mac requires a Macintosh Plus, SE, or II with at least a megabyte of RAM and a 20-megabyte hard disk drive. Versions are also available for MultiNet, as well as versions in Fox-BASE +/Mac source code. The company says it will ship eight more modules by the end of 1989.

Price: Single-user compiled version, \$295 per module; single-user source code version, \$395 per module; MultiNet source code version, \$595 per module.

Contact: Small Business Technology Corp., One Harbor Dr., Sausalito, CA 94965, (415) 331-9900. **Inquiry 1145.**



Series Six Plus accounting software now runs on the Mac.

A Pair for Forms Design

One of the latest trends in business software is the proliferation of forms software, designed for automating the common and repetitive (not to mention boring) job of filling in those ubiquitous paper forms. Case in point: Deerfield Systems' DisplayForm II is a data-entry tool that includes word processing, spreadsheet, and database management features, all focused on the job of forms processing.

With DisplayForm II, you can start with a form that you've entered into the pro-

gram via an optical scanner or from any program (such as PC Paintbrush) that's capable of producing .PCX files.

Once you've imported your form, it's displayed on-screen as a WYSIWYG image, automatically adjusted for the resolution of the monitor you're using. From there, you can place any information anywhere on the form by simply moving the cursor.

The program can also merge data from dBASE II files, letting you generate multiple forms using database information. When everything's to your satisfaction, you can either print the data on preprinted forms or print both the form and text on any dot-matrix or laser printer.

To use DisplayForm II, you'll need an IBM PC, XT, AT, PS/2, or compatible, MS-DOS 2.0 or higher, 512K bytes of RAM, a hard disk drive, and a graphics display. If you don't have an optical scanner, the company will also scan your forms to disk.

Price: \$495.

Contact: Deerfield Systems, Inc., 221 Elizabeth St., Utica, NY 13501, (315) 797-1805. **Inquiry 1143.**

And while we're on the subject, Per:FORM from Delrina Technology is another package for handling lots of data and lots of paper. Using the GEM graphical interface, the package includes both a forms-design module and a form-fill module, both of which function independently.

Although you can scan your preexisting forms into Per:FORM, you can also use its forms-design module to create your own custom forms. This module's features include boxes with multiple lines, rounded-corner boxes, automatic line spacing, vertical and horizontal text in different sizes and fonts, and exact placement of objects on-screen.

The package prints either the entire form or text only. It will also print to disk. This enables you to delay printing or to send the completed forms via modem to a remote site for later printing.

The package runs on the IBM PC, XT, AT, PS/2s, and compatibles. A graphics card is also a necessity.

Price: \$259.95.

Contact: Delrina Technology, Inc., 10 Brentcliffe Rd., Suite 210, Toronto, Ontario, Canada M4G 3Y2, (416) 423-0456; in the U.S., (800) 268-6082; in New York, (716) 835-0405.

Inquiry 1144.

continued

Phone Messages Get Computerized

Those pink "while you were out" telephone message slips are the bane of many a businessperson's existence. They're forever being misplaced. So why not computerize them?

That's exactly what Enhanced Systems has done. Its Pinksheet is a memory-resident program that can be run on individual PCs or on a local-area network.

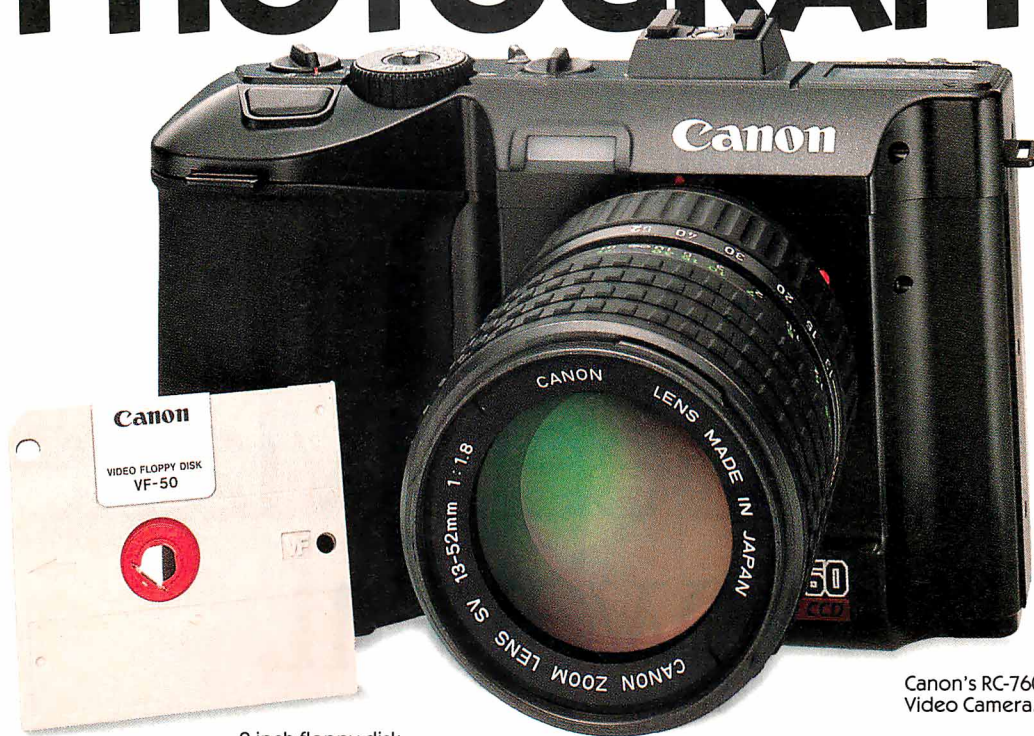
Pinksheet gives the message-taker a simple notepad-like screen, as well as a di-

rectory screen that shows extension status and messaging statistics. You can output messages to a printer, as well as use archive and retrieve functions. The program also has a reports module that organizes messages into detailed phone logs and follow-up reports.

Price: \$185.

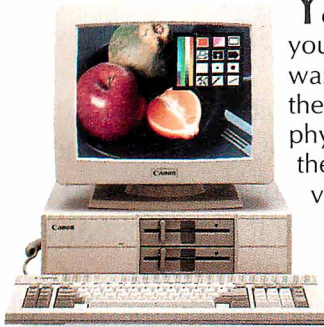
Contact: Enhanced Systems, Inc., 6961 Peachtree Industrial Blvd., Norcross, GA 30092, (404) 662-1503. **Inquiry 1148.**

COMPUTER READY PHOTOGRAPHY.



2-inch floppy disk.

Canon's RC-760 Still Video Camera.



Computer graphics come of age.

You're looking at something your computer has always wanted: a camera. It's part of the Canon Still Video photography system. And it means that the days of struggling with a video camera to load inferior images into your computer are over. For good.

For very good, in fact, because no video camera delivers both the convenience and high

resolution of the Canon Still Video system.

Take a good look. The Canon Still Video camera looks and feels just like a regular camera. You use it exactly the same way you use a regular camera. But there's no film. Instead, up to 50 images are recorded on a 2-inch floppy disk. With a Canon Still Video Recorder/Player, these images can be loaded into any computer that has a video interface board compatible with NTSC or RGB signals. Then the fun begins.

Now you're ready to use the entire array of computer graphic capabilities at your computer's disposal. For

desktop publishing. Presentation graphics. Creating your own image storage library. You name it. Play with the image any way you like. You can store the original and the changed image in the Recorder/Player.

What kind of image quality are we talking about? How about 600,000 CCD pixel resolution. More than any other still video image system. Hard copy? Canon makes a full color printer that connects directly to the system. It delivers a remarkable 160 pixels per inch, with a 64-step gradation.

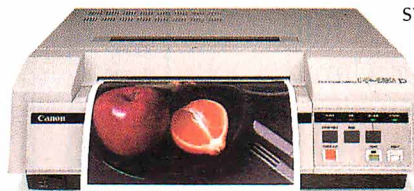
If you're ready to hear more, the best thing to do is call Canon now. Our experts can tell you

all you need to know. Just call: 1-800-221-3333, ext. 313.

The Canon Still Video System; it's what you, and your computer, have been waiting for.



Canon's RR-450 Still Video Recorder/Player.



The Canon FP-510 Printer.

CRT images are simulated.



Circle 53 on Reader Service Card

Canon

Canon U.S.A. Inc., One Canon Plaza, Lake Success, NY 11042 © 1988 Canon U.S.A. Inc.

DECEMBER 1988 • B Y T E 89

Sprint® software free
with T1200F purchase.

The Small Have Been Made Powerful.

Behold the new Toshiba T1200F

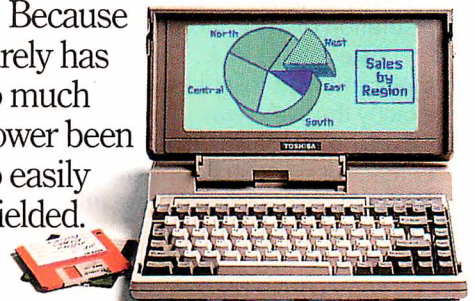
It's easily small enough to fit in the average briefcase, yet it's packed with a full megabyte of RAM, two 720KB 3½" diskette drives, and a variety of ports.

It comes in either reflective or backlit LCD models. A full-size keyboard. And for a limited time, it also comes with our exclusive version of Sprint®, Borland's powerful word processing software. Absolutely free. And because it weighs only 9.8 pounds, it's one of the lightest

IBM-compatible dual diskette PCs on earth. It even has removable, rechargeable batteries, so you can work with it just about anywhere you want.

Those who've used the T1200F have hailed it as a small miracle.

Because rarely has so much power been so easily wielded.



And The Mighty Brought Down To Size.

Where is it written that hard disk has to mean hard to carry?

Witness the Toshiba T1200HB.

It only takes up about one square foot of desk and weighs less than eleven pounds, but it's packed with all the features of our T1200F and comes with a single diskette drive and 20 megabyte hard disk.*

Which means it's big enough to store just about all the applications you'll ever use. All the time.

And, like the T1200F, it has the convenience of Resume mode,

which remembers your place even after the unit is turned off.

For more information on all our computers and printers, call 1-800-457-7777 or visit one of our nearby Toshiba dealers.

They'll make a believer out of you.

Toshiba PCs are backed by the Exceptional Care program (no-cost enrollment required). See your dealer for details. IBM is a registered trademark of International Business Machines Corp. Sprint is a registered trademark of Borland Corp. *Excludes Sprint offer.



In Touch with Tomorrow
TOSHIBA

Toshiba America Inc., Information Systems Division

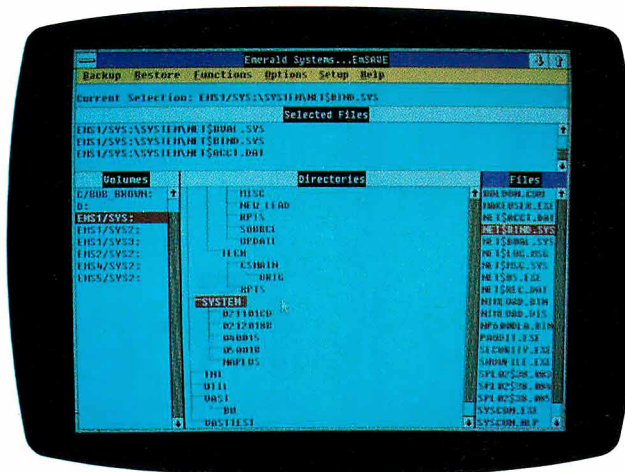
Software Saves the Network

Backing up data from multiple users on a network has always been a problem for the system administrator. The basic problem boils down to keeping track of what data belongs to whom. But Emerald Systems says it has a solution in EmSave, the first backup software designed specifically for performing and managing the backup chore on a network.

EmSave works with all cassette and cartridge backup systems, though it's optimized for Emerald's RapidRecover hardware. If you're a local-area-network administrator who performs backup and restore functions on multiple file servers, Emerald says the package will let you control those centrally located archival tasks more efficiently. For example, EmSave locates all network server files and volumes automatically, then shows them to you on-screen. There's also an intuitive mouse-based user interface; if you use the package on Emerald's RapidRecover drives, you'll also get a graphical tree display of volumes, directories, subdirectories, and files.

EmSave is shipped with five data cartridges (or cassettes) and a media-storage case. To use it, you'll need an IBM AT, PS/2, or compatible, along with MS-DOS 3.0 or higher. And of course, you'll also need a cartridge or cassette backup unit. Emerald's RapidRecover series of backup hardware starts at \$995.

Price: Cassette version, \$350; cartridge version, \$495. **Contact:** Emerald Systems Corp., 4757 Morena Blvd., San Diego, CA 92117, (800) 553-4030; in California, (619) 270-1994. **Inquiry 1165.**



EmSave tracks and controls network backup.

A SchoolMate for the Classroom

The Radio Shack folks are making a concerted effort to make their Tandy PC compatibles a big factor in the classroom. Their latest strategy is SchoolMate, a classroom networking system based on Tandy's DeskMate integrated software, MS-DOS, and either the low-cost TandyLink network or 3Com's 3+Share.

Tandy calls SchoolMate an integrated collection of applications and utilities that are specifically designed to assist students, teachers, and administrators in organizing, creating, and sharing information, software, time, and resources.

SchoolMate's classroom management applications in-

clude Roster, Grade Book, Lesson Scheduler, and Exam Maker. The administrative system can be used on a stand-alone system as well as on a network. In any case, student access to the SchoolMate network is limited to teacher-scheduled applications.

According to Tandy, there are currently more than 80 education-specific packages that run on SchoolMate, with more on the way. SchoolMate is compatible with the entire line of Tandy computers and can support up to 35 workstations and 2000 student logins per network. Each workstation and file server needs 640K bytes of RAM.

Price: \$999.95 (includes 3+Share).

Contact: Radio Shack, 1700 One Tandy Center, Fort Worth, TX 76102, (817) 390-3700.

Inquiry 1168.

Remote-Control Connectivity

Programs that let you take control of computers remotely using modems and a telephone line have been growing in popularity, especially for people who take their work home at night or need to support computer users who are spread over a wide geographical area.

In the time-proven spirit of competition, each new generation of these programs includes new features. For instance, as its name implies, pcAnywhere III is the latest and greatest incarnation of pcAnywhere.

The program lets you run any PC, terminal, non-IBM compatible with terminal emulation, or even a Macintosh from another PC at a remote location via modem, or locally through an RS-232C connection. New features include automatic callback from the host machine to the remote PC.

The pcAnywhere package comes with the software necessary for both sides of the connection.

Price: \$145.

Contact: Dynamic Microprocessor Associates, Inc., 60 East 42nd St., Suite 1100, New York, NY 10165, (212) 687-7115.

Inquiry 1166.

continued

Time on Your LANs

Project management software essentially becomes groupware when it runs on a network. Recognizing that fact of local-area-network life, Symantec has moved its popular Time Line project management package to PC-based LANs.

Time Line 3.0 works on all popular LANs. Once you

install the main File Server version on your network's file server, multiple users can share access to both project files and the program itself. Each user on the network who wants to work with Time Line also needs an individual LAN Pack.

According to Symantec, one of the biggest advantages

of Time Line on a network is the hefty amount of hard disk space it saves.

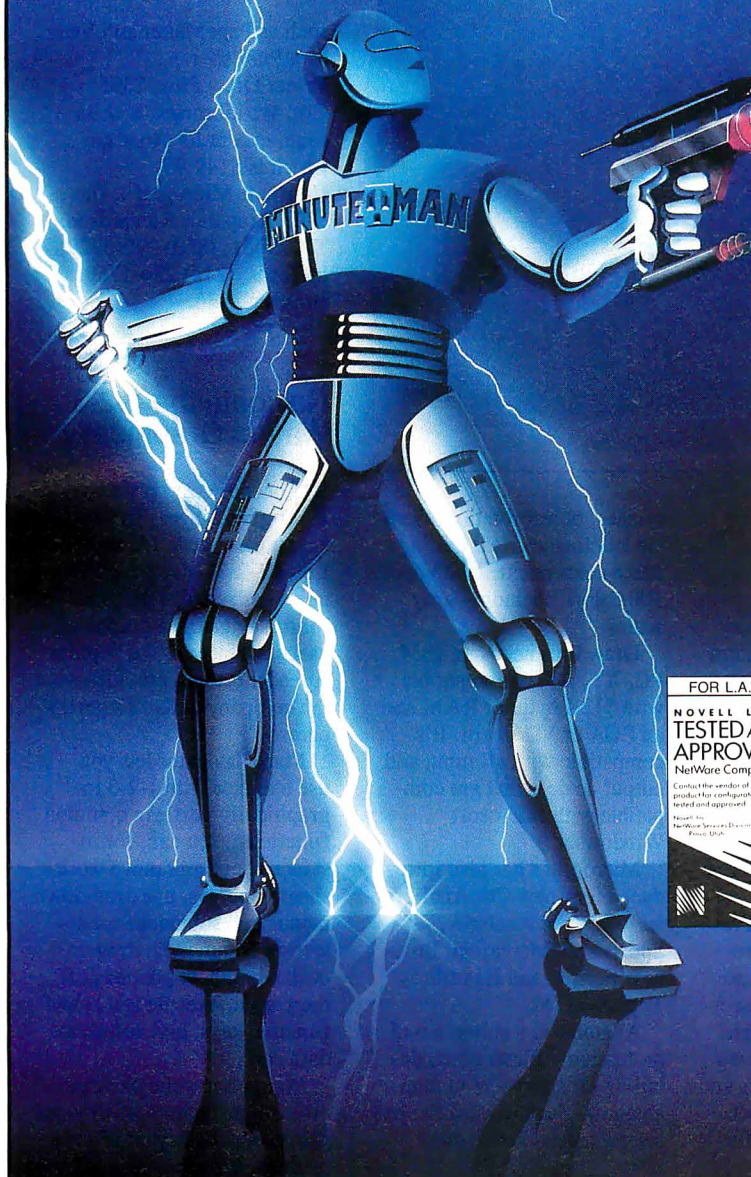
Price: File Server version, \$595; Individual LAN Pack, \$195.

Contact: Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014, (408) 253-9600.

Inquiry 1164.

MINUTEMAN[®]

UNINTERRUPTIBLE POWER SUPPLIES



"More Powerful Than Ever!"

TOTAL POWER PROTECTION

- BLACKOUTS** Enables user to operate during complete loss of power.
- BROWNOUTS** User is protected from low AC voltage below 102 volts.
- OVERLOADS** Automatic shutdown in overload situation to protect UPS from inverter burnout.
- OVERVOLTAGE** UPS runs on inverter (117 volts) when AC voltage exceeds 132 volts.
- SURGES/SPIKES** Clamps transients above 200 volts with an energy rating of 100 joules or less.
- EMI/RFI** Three stage filtering for clean AC power.



- **FULL ONE YEAR WARRANTY**
- **ORDER-SHIP SAME DAY**
- **1 MILLISECOND TRANSFER TIME***
- **SYNCHRONIZED SINEWAVE***

* 250 watt and 500 watt units offer 4 msec transfer time, PWM waveform



1455 LeMay Dr.
Carrollton, TX 75007

Telephone:
(214) 446-7363

1-800-238-7272

FAX: (214) 446-9011 TELEX: 140275 OMEGA

Power Output	120 Volt Models	230 Volt Models
250 WATT	\$ 379.00	\$ 429.00
300 WATT	\$ 549.00	N/A
500 WATT	\$ 699.00	\$ 799.00
600 WATT	\$ 899.00	\$1049.00
1200 WATT	\$1499.00	\$1749.00
1600 WATT	\$1999.00	\$2299.00

Suggested Retail



Optional Battery Packs Not Shown



250, 300 and 500 Watt Models

Bring Perspective to Your Graphics

Tired of flat and lifeless PC graphics? You can spiff up those two-dimensional charts and graphs with a new low-cost version of Three D Graphics' Perspective package. It's called Perspective Junior, and with your investment of \$149, you can make your desktop publishing and spreadsheets come more alive. With a few keystrokes, Perspective Junior transforms your data into two- and three-dimensional color graphics.

Perspective Junior can directly import data from 1-2-3, SuperCalc, Quattro, Excel, and most other spreadsheets. After it's done its work, the program exports images directly into Aldus PageMaker, Ventura Publisher, GEM Publisher, WordPerfect 5.0, and most other desktop publishing packages.

According to its makers, Perspective Junior features a simplified yet more sophisticated version of the user interface introduced by the original Perspective. It offers you 64 preset color combinations, as well as a custom color mixer. You can also change the viewing angle of any of the program's three-dimensional graphics.

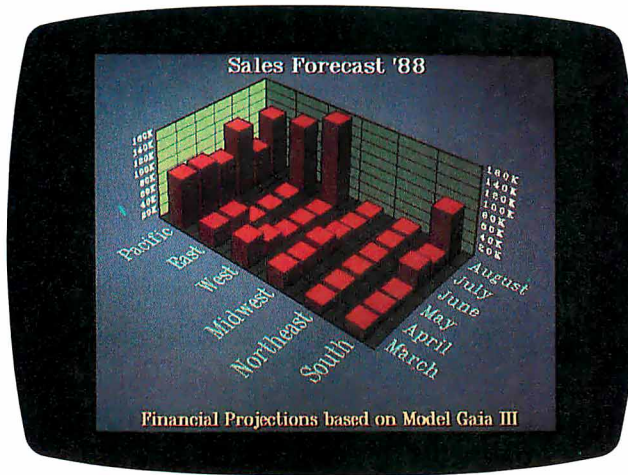
Perspective Junior can output to most laser, dot-matrix, and color ink-jet printers.

The program runs on any IBM PC, XT, AT, PS/2, or compatible and requires 512K bytes of RAM, a hard disk drive, MS-DOS 2.1 or higher, and a color graphics or Hercules-compatible card.

Price: \$149.

Contact: Three D Graphics, 860 Via de la Paz, Pacific Palisades, CA 90272, (213) 459-7949.

Inquiry 1138.



Turn 2D into 3D with Perspective Junior.

Draw, Pardner

Micrografx is a company that has staked its claim on Microsoft Windows-compatible graphics. And it has just introduced two new packages for that sometimes-venerable graphical operating environment.

The first is Draw Plus, an enhanced version of the company's Draw free-form graphics software. Draw Plus is designed for business professionals who want to create organizational charts, project flowcharts, or related graphics. It gives you both drawing primitives and design tools and includes enhancements such as context-sensitive help, the ability to use scanned

images, object rotation, flexible labeling and text editing, and 8 color palettes with over 100 colors, including gray scales.

Draw Plus needs an IBM PC, XT, AT, or compatible with 512K bytes of RAM and an EGA or VGA card. It's compatible with all input and output devices that are compatible with Microsoft Windows.

Micrografx has also introduced four new ClipArt libraries. They are Anatomy, Sports and Recreation, Business Forms, and Headline Typefaces IV.

Anatomy is a collection of professional illustrations detailing all aspects of human anatomy. Each illustration has layers, labels, and symbol IDs.

Sports and Recreation is a collection of sports images useful for newsletters and other publications.

Business Forms includes certificates, expense reports, invoices, ledgers, memos, order forms, and statements.

Headline Typefaces IV has six new typefaces: African, Balloon, Bayou, Jersey, Scoreboard, and Surf.

Each library includes Portfolio, a utility that lets you bring the art into programs

such as PageMaker and Ventura Publisher.

Price: Draw Plus, \$395; ClipArt Libraries, \$79.95 each, except for Anatomy, which is \$149.95.

Contact: Micrografx, Inc., 1303 Arapaho, Richardson, TX 75081, (800) 272-3729; in Texas, (214) 234-1769.

Inquiry 1140.

Navigate the 1-2-3 Waters Graphically

For those of you with fatigued fingers from all the keystrokes needed to use Lotus 1-2-3, Marq Technologies has relief in the guise of MarqNavigator, a graphical user interface for the popular spreadsheet that provides what the company calls "fingertip control."

MarqNavigator lets you use a mouse with 1-2-3 to graphically perform common functions. You can, for instance, open and move worksheet windows, use drop-down menus and submenus for selecting commands, drag or push worksheet portions off the screen, execute status and function keys, and accelerate data entry.

Marq claims the package offers significant performance gains over the keyboard-only method. It's especially effective if you work with large spreadsheets, where editing, moving, and cell positioning can be time-consuming indeed.

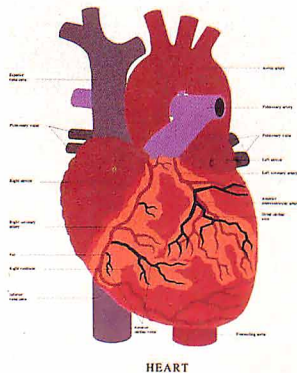
The package works with Lotus 1-2-3 versions 2.0 and 2.01 and requires 30K bytes of RAM. And, of course, you'll need a mouse.

Price: \$149.

Contact: Marq Technologies, 6285 Nancy Ridge Dr., San Diego, CA 92121, (800) 336-8366; in California, (619) 452-2373.

Inquiry 1142.

continued



HEART

Micrografx's ClipArt has an Anatomy library.

Rack and pinion for your PC.



*The feeling of
a sportscar instead
of a station wagon.*

*The HiREZ™ Mouse. You can feel
on your first lap around the screen.
responds more crisply to your*

*320 pixels for every
versus 200
ballistic*

*inch on the desktop,
for ordinary mice. Built-in
tuning and 30% less weight enable it
to go the distance without dragging its
tail, so you can cruise through your work
in less time and deskspace.*

*the difference
The cursor
control, moving*



*HiREZ travels
less distance
to complete
the same task.*

*HiREZ brings high performance to all
your favorite PC software. And the Logitech name
on the hood means you can count on what's inside.*

*After all, we build mice for companies
like Apple, AT&T, DEC, and H-P.*

*All this mousepower
comes with the
ordinary sticker
price of \$149.00.*

*Because it requires less
motion, HiREZ uses 62%
less desk space.*

*For the name
of your nearest
dealer, call*

800-231-7717.

*In California: 800-
552-8885. In Europe:
++ 41-21-869-96-56.*



LOGITECH

Personal Peripherals. Worldwide.

Circle 169 on Reader Service Card (DEALERS: 170)

Windows ClickStart Goes Express

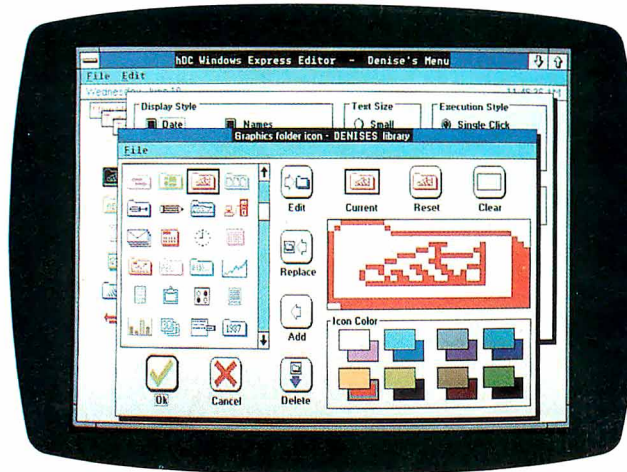
You Microsoft Windows users who crave more graphics menu options now have more choices than ever in hDC Windows Express 2.1, an enhanced version of the Windows graphic menu system that used to be known as hDC ClickStart.

The hDC Windows Express package gives you a larger number of display preferences and expanded features. For instance, you can create your own personalized icon libraries. A library with 50 icons is included.

The program also gives you an uncluttered screen with color icons instead of a screenful of file and program names.

You can also start applications with a single keystroke or mouse-click, as well as store related applications and documents in icon-represented folders.

If others will be using your system, you can use passwords to guard access to sensitive files or restrict access to MS-DOS.



hDC Windows Express makes Windows even more graphic.

The hDC Windows Express program is compatible with most Windows applications.

Price: \$79.95.

Contact: hDC Computer Corp., 15379 Northeast 90th St., Redmond, WA 98052, (206) 885-5550.

Inquiry 1169.

The Great HP Font Conversion

If you own a Hewlett-Packard DeskJet ink-jet printer and feel more than a little constrained by its limited se-

lection of low-cost fonts, there's SoftFontWare's LaserJet to DeskJet font-conversion package.

As its name implies, the package will happily convert any soft font designed for the LaserJet so it will work on the DeskJet.

There are hundreds of widely available public domain and shareware fonts available from bulletin boards.

Price: \$42.

Contact: S.H. Moody & Associates, Inc., SoftFontWare, 1810 Fair Oaks Ave., South Pasadena, CA 91030, (818) 441-2260.

Inquiry 1173.

Products on the Stack

The trickle of HyperCard stacks for the Apple Macintosh is fast becoming a torrent, and innovative uses are fast being found. Like shopping, for instance. Here are two prime examples:

If you're an inveterate bargain hunter, HyperShopper will keep your attention for hours on end. It's a HyperCard stack that lists over a thousand discount mail-order companies and factory outlets. It also lists the products they sell and the brands they carry.

In order to qualify for a listing in HyperShopper, a company must sell its products at least 30 percent below retail or sell truly unique or hard-to-find merchandise.

Price: \$19.95.

Contact: Camtronics Software, 224 Nelson Lane, P.O. Box 1, Camas Valley, OR 97416, (503) 445-2824.

Inquiry 1171.

And for Macintosh users, dealers, and consultants who need to keep track of the latest information about Macintosh-related services, products, programs, and peripherals, there's SuperMasterFile. It's a HyperCard stack with over 5000 Macintosh-related product cards.

SuperMasterFile runs on the Mac Plus, SE, and II and requires HyperCard 1.1 or higher, plus a hard disk with at least 3 megabytes of free space. The package includes five disks in a carrying wallet, with the disks in Apple's HD Backup format. Quarterly updates are available.

Price: \$59.95.

Contact: New Edge, Inc., Noone Falls, Peterborough, NH 03458, (800) 284-3330; in New Hampshire, (603) 924-9100.

Inquiry 1172.

A File by Any Other Name

Memory-resident programs that let you use long textual descriptions of files instead of often-cryptic 8-character filenames are becoming a hot item. The latest comes from Carmel Computer Products, whose File Control lets you use names up to 108 characters long.

But there's more. File Control also lets you organize documents in named folders and manage individual files or whole folders in a cross-referenced index. The only files you see in an index

are the ones you store.

The program has a natural-language interface that's designed to let anyone who uses your computer system find a file easily. There's also a keystroke recorder that lets you create macros—which the company calls *controls*—for almost any application. Predefined controls are included for WordPerfect, Lotus 1-2-3, WordStar, SuperCalc, and other programs.

File Control works with most popular application programs, including those

named above plus, among others, Quattro, Microsoft Word, Symphony, PFS:First Choice, and XyWrite III Plus. The program uses about 90K bytes of RAM and requires an IBM PC, XT, AT, PS/2, or compatible with MS-DOS 2.11 or higher. File Control is not copy-protected.

Price: \$59.95.

Contact: Carmel Computer Products, Inc., Carmel Valley Village Center #8, P.O. Box 215, Carmel Valley, CA 93924, (408) 659-3155.

Inquiry 1170.



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

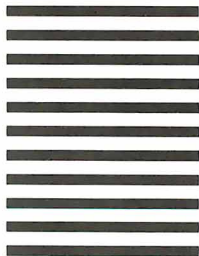
BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 42 HIGHTSTOWN, NJ

POSTAGE WILL BE PAID BY ADDRESSEE

BYTE

Subscription Dept.
P.O. Box 550
Hightstown, NJ 08520-9886



**\$19
OFF**

INTRODUCTORY OFFER

**\$19
OFF**

Enjoy BYTE magazine's in-depth information on all the latest in personal computing each month at our special introductory rate!

Subscribe now and save \$19 off the newsstand price—12 issues for \$22.95 instead of \$42.00... and \$7.00 off the regular subscription rate of \$29.95. You'll also receive our special IBM PC issue as part of your subscription.

☐ U.S.A. \$22.95 for 1 year ☐ Canada/Mexico \$27.95 U.S. for 1 year

☐ Bill me

☐ Payment enclosed

☐ Charge to my

☐ MasterCard

☐ VISA

Account # _____

Expires _____

Signature _____

☐ This is a renewal order.

Name _____

(Please Print)

Company _____

Address _____

City/State _____

Country _____ Code _____

BYTE

IBJ0105

Please allow 6-8 weeks for processing your subscription.

**\$19
OFF**

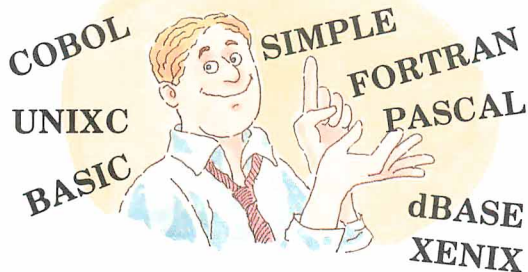
LOWEST RATES

**\$19
OFF**

SPECIAL SAVINGS

SPECIAL SAVINGS

If your idea of Romance Languages includes BASIC and C, then we have a great deal for you.



- ☐ U.S.A \$22.95 for 1 year
- ☐ Canada/Mexico \$27.95 U.S. for 1 year
- ☐ Bill me
- ☐ Payment enclosed
- ☐ Charge to my () VISA () MasterCard
- Account # _____
- Expires _____
- Signature _____
- ☐ This is a renewal order.

Packed with in-depth information on the latest in microcomputing, BYTE magazine is written to stimulate the minds of almost half a million personal computing experts. Now, you too can enjoy BYTE each month at our special introductory rate.

Subscribe now and save \$19 off the newsstand price...12 issues for \$22.95 instead of \$42.00...and \$7.00 off the regular subscription rate of \$29.95. You'll also receive our special IBM PC issue as part of your subscription!

IBJ0139

Name _____

(Please Print)

Company _____

Address _____

City/State _____

Country _____ Code _____

BYTE



Please allow 6-8 weeks for processing your subscription.



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

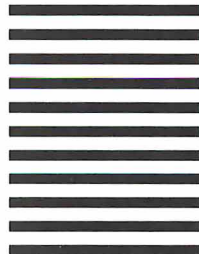
BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 42 HIGHTSTOWN, NJ

POSTAGE WILL BE PAID BY ADDRESSEE

BYTE

Subscription Dept.
P.O. Box 550
Hightstown, NJ 08520-9886





BYTE

The PERFECT Gift

REWARD THE COMPUTER ENTHUSIASTS ON YOUR GIFT LIST WITH A YEAR'S SUBSCRIPTION TO BYTE — THE DEFINITIVE GUIDE TO PERSONAL COMPUTING.

EACH GIFT WILL INCLUDE 12 ISSUES, PLUS A BONUS ISSUE DEDICATED TO IBM PC'S. YOUR FIRST GIFT WILL COST ONLY \$22.95 WITH ADDITIONAL GIFTS COSTING EVEN LESS; ONLY \$19.95 EACH — BOTH GREAT MONEY SAVING RATES WHEN YOU CONSIDER THAT ONE YEAR OF BYTE PURCHASED AT THE NEWSSTAND WOULD COST \$42! (CANADA: FIRST GIFT \$25.95, ADDITIONAL GIFTS \$22.95 EACH.)

DON'T GET CAUGHT IN THE HOLIDAY RUSH, SEND US YOUR GIFT LIST TODAY AND WE'LL DO THE REST.

YES! I want to send gift subscriptions to the following people and save money off the newsstand price!



TO: (1st Gift—\$22.95; Canada \$25.95)

IBD0078

Name _____

Address _____

City/State/Zip _____

(Each additional gift—\$19.95; Canada \$22.95 each)

Name _____

Address _____

City/State/Zip _____

Name _____

Address _____

City/State/Zip _____

Name _____

Address _____

City/State/Zip _____

FROM:

Name _____

Address _____

City/State/Zip _____

☐ Payment enclosed* ☐ Bill me

☐ Charge to: ☐ VISA ☐ MasterCard

Acct. # _____ Exp. date _____

Signature _____

*Please send this order card with payment in an envelope to: P.O. Box 550, Hightstown, NJ 08520-9893

FREE BONUS — A gift announcement will be sent in your name to the recipient.

Please allow 6-8 weeks for processing.



BYTE

The PERFECT Gift

REWARD THE COMPUTER ENTHUSIASTS ON YOUR GIFT LIST WITH A YEAR'S SUBSCRIPTION TO BYTE — THE DEFINITIVE GUIDE TO PERSONAL COMPUTING.

EACH GIFT WILL INCLUDE 12 ISSUES, PLUS A BONUS ISSUE DEDICATED TO IBM PC'S. YOUR FIRST GIFT WILL COST ONLY \$22.95 WITH ADDITIONAL GIFTS COSTING EVEN LESS; ONLY \$19.95 EACH — BOTH GREAT MONEY SAVING RATES WHEN YOU CONSIDER THAT ONE YEAR OF BYTE PURCHASED AT THE NEWSSTAND WOULD COST \$42! (CANADA: FIRST GIFT \$25.95, ADDITIONAL GIFTS \$22.95 EACH.)

DON'T GET CAUGHT IN THE HOLIDAY RUSH, SEND US YOUR GIFT LIST TODAY AND WE'LL DO THE REST.



BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 42 HIGHTSTOWN, NJ

POSTAGE WILL BE PAID BY ADDRESSEE



Computers and Communications Information Group
P.O. Box 550
Hightstown, NJ 08520-9893

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



Electrified

WE WILL TRY TO BEAT ANY PRICE ON ANYTHING FROM ANYWHERE !!!
A TRULY PROFESSIONAL STAFF WITH A COMMITMENT TO SERVICE !!!

LOWEST PRICES

QUICK DELIVERY

★ ITT - XTRA - XP - 80286 - POWER ★

In a XT Compatible Computer System

COMPARE: THIS IS THE BEST COMPUTER VALUE IN THE USA!!!

Base System Includes: **BRAND NEW**

80286 Processor - FAST!!

- 512K Installed • Expandable to 640K on the Motherboard
- 80287 Socket • 5 - XT Slots • Parallel/Serial Ports • Floppy Controller
- Deluxe Keyboard • 155 Watt Power Supply • Small Footprint
- Warranty by Servcom - 30 Days to the End User

AMAZING!!
COST

SYSTEM OPTIONS:

Add a 360K - 5 1/4" Drive	\$ 79
Add a 10MB Drive	179
Add a 20MB Drive	249
Add a 30MB Drive	319
Add a 45MB Drive	399
Increase Memory to 640K	99
Mono Card	49
Color Card	69
Mono Monitor - 12" TTL	169
Color - RGB Monitor	169

Requires ITT DOS 3.2
COST \$39

LIST
\$2185

\$499

DATAMEDIA ELITE 30

Elite 30 Terminal

BRAND NEW - 12" SCREEN

LIST
\$575

AMAZING ONLY
\$99

QUANTITY PRICING AVAILABLE!!

- Teletype 950 and ADDS Viewpoint Compatibility
- Non-glare • Flicker Free • High Resolution • GREEN
- Powerful Local Editing Features • Detachable Keyboard • Buffered Operation • Block-Mode Transmission • 22 PROGRAMMABLE FUNCTION KEYS • PRINTER/MODEM (RS-232C) CONNECTION • Swivel Base



★ **TNIX 4015 - Hi-Res**
• RGB • CGA Color Monitor
14" • 640 × 200 • .31 Dot Pitch
LIST \$630 **COST \$219**

★ **TNIX 4035 - RGB**
• CGA Color Monitor • 14" • 640 × 200
.43 Dot Pitch
LIST \$550 **COST \$179**

★ **TNIX 12" • TTL-Amber**
QUANTITY 100 AS LOW AS **\$49**

★ THOMSON 4160 ★

14" CGA COLOR MONITOR
Hi-Res. • .38 Dot Pitch • 640H × 240V
RGB Input - Up to 256 Colors
Switches to Amber or Green for Text

LIST \$550

\$199

FULL 1 YEAR WARRANTY
Refurbished - Brand New Condition

★ CHEAP MEMORY ★

IBM-256K-MEMORY CARD

Fully Populated with 256K
Only Works at 4.77MHz Speed

Cost \$69 - Quantity 1
\$59 - Quantity 12

GOLDSTAR
All Monitors are Refurbished by
Tel-ko, are labelled Tnix, and have a
60 Day End User Warranty - BRAND NEW CONDITION!!

TNIX 4175-EGA Color Monitor
14"-Non Glare, 640 × 350,
.31 Dot Pitch
LIST \$650 **COST \$269**

THOMSON-4375
14" ULTRASCAN COLOR MONITOR DISPLAYS UP TO 256 COLORS
• 31 mm dot pitch • 800H × 560V resolution, compatible with CGA, EGA, VGA, MDA, VGA
• Automatically adjusts to changes in modes or adapters by switching to any horizontal frequency between 15 and 35 KHz • Automatically scans vertical frequencies from 45 to 75 Hz • 3 video input connectors: supports RGBI, RGB, RGB Analog, monochrome TTL and video composite
• Super high-contrast non-glare screen • Front mounted controls • Includes tilt-swivel stand
• Toll-free "800" technical support • 1 year warranty • Refurbished - Brand New Condition
★ MULTI SCAN MONITOR CARDS STARTING AT \$169 ★
Quantity Discounts Available!

LIST
\$895

\$449

THE LEAST EXPENSIVE RGB COLOR MONITOR IN THE USA
THOMSON 4120 ★ 14" CGA COLOR MONITOR
For value and versatility, the 4120 has no competition. It's RGBI, RGB analog, and composite modes make the 4120 ideal for IBM PC and compatibles. It's built-in speaker allows it to be used as a television monitor when connected to a VCR or tuner. It's compatible with IBM, Apple, Atari, AMIGA, and Commodore computers with optional adapters.
1 YEAR WARRANTY - REFURBISHED - BRAND NEW CONDITION
WITH ANY MONITOR PURCHASE - STB - CHAUFFEUR - HT. COLOR MONO VIDEO CARD
LIST \$430 **COST \$169**

ONLY \$79 - BELOW COST!!

★ PRINTER POWER ★

IBM 5182

★ COLOR PRINTER ★



\$499 SAVE
LIST \$1995

COMPARE - THIS IBM IS THE BEST
PRINTER VALUE IN THE UNIVERSE!!!

★ BRAND NEW • HEAVY DUTY ★

- WIDE CARRIAGE (132 Column)
- 200 CPS Draft, 110 CPS Correspondence, 35CPS NLQ
- Prints Black, 4 Colors, and 8 Colors • BiDirectional Dot Matrix
- 9 Wire-Parallel Interface • Tractor

FRONT - BOTTOM - REAR PAPER FEED
SOUND COVER BUILT IN, Up to 4-Part Form.

PAPER RACK AVAILABLE-Stacks Printed Paper - ONLY \$12.95
Easy Change Cartridge Ribbons - AVAILABLE
★ QUANTITY PRICING - CALL !!! ★
30 DAY WARRANTY

★ DIABLO D80IF ★

Letter Quality- 80 CPS ★ BRAND NEW ★
LIST \$2070-SOLD BELOW COST

With Dual Bin Cut Sheet Feeder
Wide Carriage - Requires Cable
30 Day Warranty

YOUR COST **\$799**

CENTRONICS HPC-136B
LIST \$899 (Centronics Now Owned By GENICOM) LIST \$899

★ 180 CPS ★ 34 NLQ ★

★ WIDE CARRIAGE ★

BRAND NEW
• Full 1 Year Parts and Labor Warranty
• 4K - Print Buffer - Cartridge Ribbon.

- DRAFT - 11 × 9 Dot Matrix,
- NLQ - 23 × 18 Dot Matrix
- IBM and Epson Emulation
- With Push Tractor

Parallel Version **\$269**

Serial/Parallel Version **\$299**

QUANTITY PRICING IS AVAILABLE

HEWLETT PACKARD	CALL
LaserJet II - Lowest Price Possible	CALL
NEC	CALL
LC-850 P2200 5200 5300	
TOSHIBA	
P-321SL	\$459
P-341	was \$559 NOW \$499
P-341SL	\$569
P-351-SX	\$595

★★ Electrified Discounters ★★

1066 SHERMAN AVENUE
HAMDEN, CT 06514
FAX 203-248-8680

\$2 refund on all
telephone orders over \$100

(203) 287-1976

DEALER INQUIRIES
INVITED

CATALOG SENT WITH ALL ORDERS



All Prices listed are Cash Discounted
Add 2.5% for MasterCard, Visa, or
AMEX. Not responsible for typographical
errors. Prices are subject to change with-
out notice. Govt. residents add 7.5%
sales tax. Quantities are limited. Prices do
not include freight. Allow 2 weeks for per-
sonal company check clearance. 20%
resocking fee minimum on all returns.
Compatibility is not guaranteed. IBM is a
registered trademark of International
Business Machines, Inc.

WHAT'S NEW

METRO NEW YORK • NEW ENGLAND

Group Helps Nonprofit Organizations

One of the most important tasks of a nonprofit organization is to organize its information, especially regarding possible sources of hard-to-find funding. Many nonprofits use donated computer equipment to accomplish this, but the equipment is often obsolete or the wrong solution. Connect is an organization dedicated to providing information and referral services to nonprofit organizations that don't have the money or the work hours to invest in sophisticated systems but need the technology to compete.

According to Mitchell Rosenberg, program director for

Connect and vice president of parent company Technical Development, since the spring of 1988, Connect has been sponsoring two-day courses on how nonprofit groups can use computers. This fall, the program started offering instant telephone support and referral services to members.

According to Rosenberg, part of Connect's mission is to ensure that nonprofits not only get good technology but know how to use it efficiently, especially as large corporations start parting with their 8088-based machines. It's a complex job, but he said that donations from Lotus, the Fidelity Foundation, and the United Way have helped.

Price: \$150 to \$250 fee (depending on your budget).

Contact: Lisa Breit, Connect, c/o Technical Develop-

ment Group, 11 Beacon St., Boston, MA 02108, (617) 523-7557.

Inquiry 918.

Advanced LAN Conference

Local-area networks are growing in popularity due to increased demand for productivity and efficiency in the work place. A conference that will deal with LAN productivity, management, security, and standards will be held in New York from November 30 to December 2.

The conference is designed to help attendees define their requirements, choose the right system, and understand configurations available with today's LAN. The chairperson

will be Roy Pepper, a consultant with 23 years of experience in the communications field. The seminar is for business managers, technicians, and planners.

Price: \$995.

Contact: Digital Consulting, Inc., 6 Windsor St., Andover, MA 01810, (508) 470-3880.

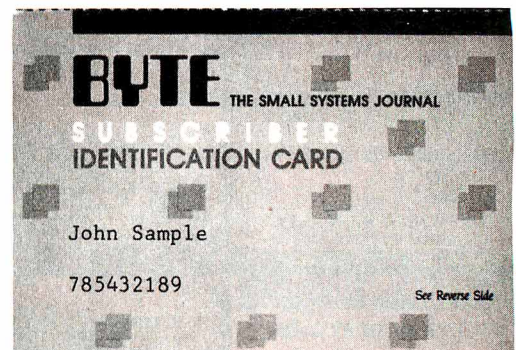
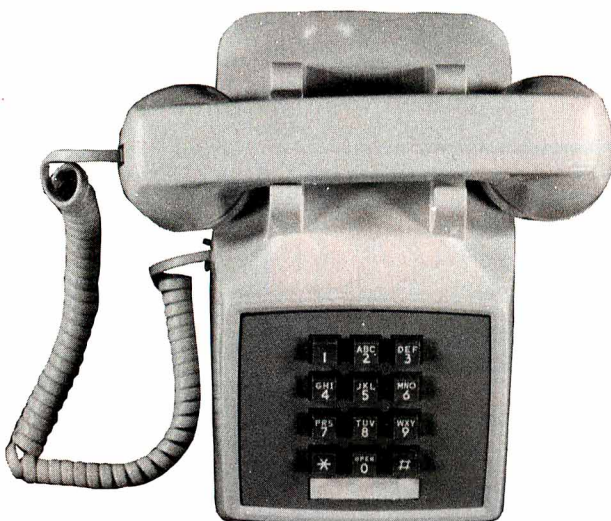
Inquiry 920.

Shopping for the Silicon Set

A museum that claims it's the only one in the world solely dedicated to computers and their impact on society is now offering a catalogue of gifts that you can give to your favorite techie for Christmas. If that human hard disk of

continued

Important TIPS* for BYTE Subscribers: Receive Product Information 10 Days Earlier!



All you need is a touch-tone telephone and your subscriber I.D. number. See instructions facing the Reader Service Index in the back of this issue for outrageous time-saving opportunities!

*BYTE's Telephone Inquiry Processing Service

DECEMBER 1988 • B Y T E 96NE-3

yours, called the brain, has just gone blank on gift ideas, the catalog has everything from pins and earrings made out of circuit boards to an affordable make-your-own robot kit.

The Computer Museum is also offering a collection of books to brush up on computer pioneers and history, circuit-design silk ties for the fashion-conscious programmer, and another tie with a scaled-down version of a slide ruler.

Also available are computer puzzles, games, posters, and card sets.

Price: The catalog is free of charge.

Contact: The Computer Museum Store, 300 Congress St., Boston, MA 02210, (617) 426-2800.

Inquiry 919.

The Computer Flea Market Hits Northern New Jersey, Too

Ken Gordon Productions has been sponsoring computer shows since 1980, and according to its president, it is the largest and oldest promoter of computer shows in the U.S. The show welcomes companies as large as Computerland Stores and as small as mom and pop (or kid) garage operations.

One will be held at the Sheraton Hotel in Boxborough, Massachusetts, off Route 495's exit 28, from 10 a.m. to 4 p.m. on December 11. Another will be held at William Paterson College in Wayne, New Jersey, on December 17.

Contact: Ken Gordon Pro-

ductions, P.O. Box 13, Franklin Park, NJ 08823, (800) 631-0062; in New Jersey, (201) 297-2526.

MacWorld Expo in San Francisco

If you missed the crowds (and the heat) at MacWorld Expo in August, held in three locations in Boston, you have another chance to catch up on the latest new products and applications for the Macintosh, only this time the Expo will be held in balmy San Francisco, from January 20-22.

The Expo will start off with an industry day on January 19, open only to dealers, vendors, and third-party developers. More than 1200 booths and displays are ex-

pected for the show.

Price: \$20 for exhibits only; \$75 for the conference and exhibits.

Contact: Mitch Hall Associates, P.O. Box 155, Westwood, MA 02090, (617) 329-9911.

Inquiry 921.

Send Us Your Local News

BYTE is expanding its coverage of local events in the Metro New York/New England region. If you would like your events, seminars, conferences, or computer users group covered, please send information to: Regional Editor, BYTE, One Phoenix Mill Lane, Peterborough, NH 03458.

BERKELEY HEIGHTS, NJ "OUR SERVICE MAKES THE DIFFERENCE" NEW PROVIDENCE, NJ

IN STOCK

LEADING EDGE®

IN STOCK

COTTAGE COMPUTERS IS A

LEADING EDGE®
AUTHORIZED RETAIL DEALER
AUTHORIZED SERVICE CENTER



Leading Edge® Computers From \$595

MODEL "D"®

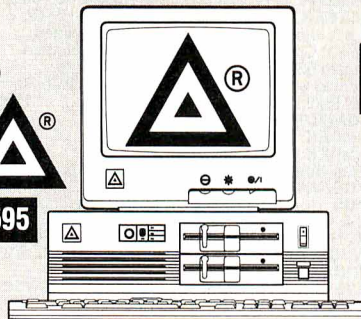
PC® XT® COMPATIBLE

MODEL D2™

AT® COMPATIBLE

IBM® COMPATIBLE

20 MONTH WARRANTY



NEW D3™

16 MHz 386
65 Meg Hard Drive
2 Meg RAM
MS DOS® + OS/2
VGA Video Card

VGA Monochrome Monitor
or
VGA Color Monitor

Cottage Computers™



Mon.-Sat. 10-5:30
Thurs. til 8
© 1987, 1988 CC/DEI

"OUR SERVICE MAKES THE DIFFERENCE"

(201) 464-8386

WE SPECIALIZE IN LEADING EDGE® COMPUTERS

1253 SPRINGFIELD AVE.
NEW PROVIDENCE, N.J.
07974

FOR **QUANTITY PRICES** ASK FOR **CORPORATE ACCOUNTS DEPT.**

Spear's Systems are becoming landmarks in the computer industry.

48 hour
Burn-in
Test

SUPER 386/20

\$2995

- 80386 CPU, 20MHz SI=23
 - 14" Flat Screen Hi-Res Mono Monitor
 - Evergraphic Mono Card
 - 2 Serial & 1 Parallel Ports
 - 1.44MB 3 1/2" Floppy
 - 40MB HH Hard Drive
- Add \$280 for Tower Case

MONO-286/8

\$995

- 80286 CPU 8/6 MHz
- Hercules Compatible Mono card
- Monochrome monitor

EGA-286/8

\$1620

- 80286 CPU 8/6 MHz
- EGA monitor and EGA card
- 20MB HH Hard Disk

PRO-286/10

\$2150

- 80286 CPU 10 MHz/1WS
- EGA card
- Diamond Scan monitor
- AT 30 MB Hard Disk

MONO-286/12

\$1499

- 80286 CPU 12 MHz/0WS
- Small footprint to save space
- Mono card
- Monochrome monitor

SUPER-286/12

\$2490

- 80286 CPU 12 MHz/0WS
- Small footprint
- EGA card and Diamond Scan monitor
- 1.44M 3 1/2" floppy drive
- 40MB HH Hard Disk



EGA-286/12

\$2151

- 80286 CPU 12 MHz/0WS
- Small footprint
- EGA monitor and EGA card
- 20MB HH Hard Disk

MONO-386

\$2050

- 80386-16 CPU
- 16/6 MHz/0WS Wait State
- 64K SRAM Cache
- Mono monitor and card

EGA-386

\$2540

- 80386-16 CPU
- EGA monitor and EGA card
- 20MB HH Hard Disk

SERVER-386

\$3295

- 80386-16 CPU
- EGA card
- Diamond Scan monitor
- 71 MB Hard Disk

OTHER PRODUCTS:

Everex Modems

- 1200B Internal
- 2400B Internal
- 2400B External

\$99
\$175
\$199

Everex Tape Backup

- 40MB External
- 60MB Internal
- 125MB Internal
- 40MB Floppy Tape

\$620
\$650
\$1195
\$399

Hard Disk

- 20MB (XT)
- 40MB (HH)
- 71MB

\$269
\$580
\$865

XT MONO System (10MHz) **\$599**

BRAND NAME LAPTOP

(640K, 2Drives) **\$1259**

Graphic cards, EMS cards, monitors, printers, 3 1/2" floppy drives, etc.

CALL

To Order Call Our Toll Free Number:

(800) 282-1212
(312) 480-7300 (Illinois)

SPEAR
TECHNOLOGY INC.

710A Landwehr, Northbrook, IL 60062
Sales: (312) 480-7300
Tech Support (312) 480-7386
FAX: (312) 480-9538
Spear 03 V1.2 7/20/88

Attractive Discount for Dealers and Quantity Buyers.

Special Discounts for Students and Professors (ID required).

Everex, Hercules, IBM, AT, Diamond Scan, and OS/2 are trademarks and registered trademarks of their respective companies.



Spear Technology, Inc. provides you with excellent quality and services. If you are not satisfied for any reason please call our president, Webster or V. P. Ahmed at (312) 480-7300. If you have any technical questions, our full-time technical support staff is there to answer them.

Terms: We accept MasterCard, Visa, COD (Cashier check, cash, or approved check), Company/Institutional P.O. For returns and repairs, call for RMA number. A 15% restocking on all unauthorized returns item. No credit issued after 30 days from date of shipment. Copies of original sales order must accompany any return. Prices are subject to change.

Turn
DEC Computing
“**No**how”
Into
DEC Computing
Know-How

You can't accept "no way, nohow" answers when it comes to your Digital Equipment system. And you don't have to. The DEC computing know-how you *must* have is right here. Find it at DEXPO East 89.

Test the latest VAX*, MicroVAX*, and PDP-11* enhancements. Evaluate over 10,000 products for multi-vendor DEC systems. Compare new technologies from 250 suppliers. Explore ***The Apple-Digital Integration Center***. It features leading edge solutions from Apple and dozens of Apple-Digital developers. Concurrent conference sessions explore Apple-Digital issues and trends.

Develop strategies for the successful integration of VAX architecture into business environments. DEXPO's **"Corporate VAX" Conference** features 50 practical sessions on all aspects of VAX management.

Plus, build skills and productivity at **Technical and Training Seminars** provided by ERI Training

Save time and money by doing it all at one show.

Call for **FREE** V.I.P. tickets to the show (each a \$20 value). Plus, you'll get a **FREE** Preview of 100 products on exhibit and a complete Conference & Seminar schedule.

Organized by Expoconsul International, Inc. 3 Independence Way, Princeton, N.J. 08540

*Registered trademark of Digital Equipment Corporation

DEXPO® East 89

The Complete DEC Computing Exposition & Conference*

DEXPO HOTLINE: 800-87-DEXPO
Passenger Ship Terminal • New York City • Feb. 8-10, 1989
(48th & 55th Streets at 12th Ave.)

DECEMBER 1988 • B Y T E 96NE-7

Com-Tek Data Systems, Inc.

SPECIAL COMPLETE SYSTEM

MODEL IQ-8088-I SYSTEM

10 mhz Mother Board—640K Ram
(2) 360K Floppy Drives
Mono Monitor—84 Keyboard
Multi-I/O—Phoenix Bios
Parallel, Serial, Game Ports
Printer Panasonic 1080i
MS-DOS ver. 3.3

\$1295⁰⁰

POWERFUL Performance at a practical price is what you will get with COM-TEK's SUPER TURBO X/T. Configured to your specifications at a very reasonable price, our X/T is built to suit your every need.

\$895

MODEL IQ 8088-X/T—THE WISE CHOICE

POWERFUL Performance at a practical price is what you will get with COM-TEK's SUPER TURBO A/T.



The Personal Computer that will run away with you. Home or Office.

Complete System Includes

- * LS-A804 All in One Multi Main Board
- Selectable CPU speed of 4.77/10 Mhz
- Complete W/Multi I/O + MCGP-Mono+Graphics Card
- RS-232 Serial adapter, Parallel printer adapter
- Game Port adapter/360 Kbyte Floppy adapter
- Microsoft Bus version mouse adapter
- Real Time Clock/Calendar
- CPU 8088-1/512 Memory Expandable to 640KB
- Award or Phoenix Bios Included
- Keyboard Lock, Power LED/Turbo Mode LED
- * 150 watt power supply/ X/T Slide case
- * 20 Meg Seagate Hard Disk/ 360K Floppy Disk
- * Keyboard 84 Key/ Packard Bell 12" Monochrome Monitor
- ** Printers Optional**
- *** FREE Word Processing Software...

HARDWARE PRICES

20 Meg with Controller Card	\$275.00
40 Meg with Controller Card	\$425.00
80 Meg with Controller Card	\$775.00
360K Floppy Drive	\$ 80.00
1.2 Floppy Drive	\$115.00
3.5 Floppy Drive	\$120.00
1.44 Floppy Drive	\$130.00
Mono Card	\$ 49.00
EGA Mono Card	\$142.00
CGA Color Card	\$ 48.00
EGA Color Card	\$112.00
VGA Color Card	CALL
Taxan 770 Multi Sync Monitor	\$640.00
Packard Bell Mono Monitor	\$ 85.00
Im-Tec Color Monitor	\$245.00
Casper Mono Monitor	\$ 80.00
Reliata EGA Monitor	\$435.00
NEC Multi Sync II VGA	\$640.00
Taxan EGA Monitor	\$475.00
AT Controller Card	\$142.00
XT Controller Card	\$124.00
Floppy Disk Controller Card	\$ 18.00
XT Multi I/O Card	\$ 58.00
XT Pre-built 3 in 1 Motherboard	\$235.00
XT Pre-built Motherboard	\$185.00
AT 80286 Pre-built Motherboard	\$485.00
AT 80286 Pre-built Motherboard	\$1895.00
AT 80286 Baby Pre-built M/B	\$495.00
84 Keyboard	\$ 48.00
101 Enhanced Keyboard	\$ 65.00
8086-10 MHZ 3 in 1 Motherboard	\$145.00
8086-10 MHZ Motherboard	\$120.00
80286-12.5 MHZ Motherboard	\$342.00
80286 Baby 12.5 MHZ Motherboard	\$338.00
80386-16 MHZ Motherboard with 1 Meg	\$1825.00
XT/AT Slide Case	\$ 34.00
AT Baby Case	\$ 58.00
AT Slide Case	\$ 65.00
AT Tower Case	\$285.00
Baby AT 200 Watt Power Supply	\$ 72.00
150 Watt Power Supply	\$ 48.00
200 Watt Power Supply	\$ 88.00
40 Meg Tape Backup System	\$349.00
MS-DOS 3.3 GWIBASIC	\$120.00
1200 Modem	\$ 95.00
2400 Modem	\$235.00
Printers	CALL

POWERFUL Performance at a practical price is what you will get with COM-TEK's SUPER TURBO IQ 80386. Configured to your specifications at a very reasonable price, our IQ 80386 is built to suit your every need.

MODEL IQ 80386—THE SUPER WISE CHOICE!

\$3295
\$3045

with EGA monitor \$3495

• COM-TEK HAS DESIGNED THEIR POLICY TO BETTER SERVE, HELP AND PROTECT THEIR CUSTOMERS.

• COM-TEK MAKES SURE ALL THEIR CUSTOMERS GET 1st PRIORITY IN SALES—SERVICE—CUSTOMER RELATIONS

• COM-TEK'S FRIENDLY STAFF IS BETTER TRAINED TO HELP AND SUPPORT YOU IN EVERY WAY POSSIBLE WITHOUT LEAVING YOU ON HOLD.

30 DAY MONEY BACK GUARANTEE FOR ANY REASON—NO QUESTIONS ASKED—1 YEAR ON PARTS AND LABOR—LIMITED DEPOT WARRANTY

SYSTEMS • SYSTEM OPTIONS • NETWORKING
CALL FOR SPECIFICATIONS

In N.H.: 603-363-8333

1-800-942-4255 Outside of N.H.

P.O. Box 221

Corner of 9 & 63, Chesterfield, N.H. 03443

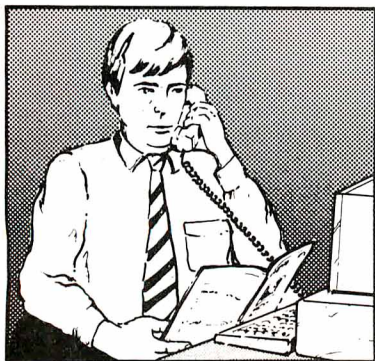
Tech Support Call: 603-363-8334

XT and AT are registered trademarks of International Business Machines.

Please Come See Us at
Nashua Computer Fair,
Nashua Sheraton, Tara Blvd.,
Booth #3062 December 17, 1988
Don't miss the bargain on new
and used computer peripherals,
supplies, software, parts, and
books. Featuring great buys on
most major brands and PC
clones, 100 tables all indoors.
Tables available for dealers. Con-
tact Dan at 603-363-8333.

TAX FREE N. H.

Buy with Confidence



In an effort to make your telephone purchasing a more successful and pleasurable activity, The Microcomputer Marketing Council of the Direct Marketing Association, Inc. offers this advice, "A knowledgeable buyer will be a successful buyer." These are specific facts you should know about the prospective seller before placing an order:

Ask These Important Questions

- How long has the company been in business?
- Does the company offer technical assistance?
- Is there a service facility?
- Are manufacturer's warranties handled through the company?
- Does the seller have formal return and refund policies?
- Is there an additional charge for use of credit cards?
- Are credit card charges held until time of shipment?
- What are shipping costs for items ordered?

Reputable computer dealers will answer all these questions to your satisfaction. Don't settle for less when buying your computer hardware, software, peripherals and supplies.

Purchasing Guidelines

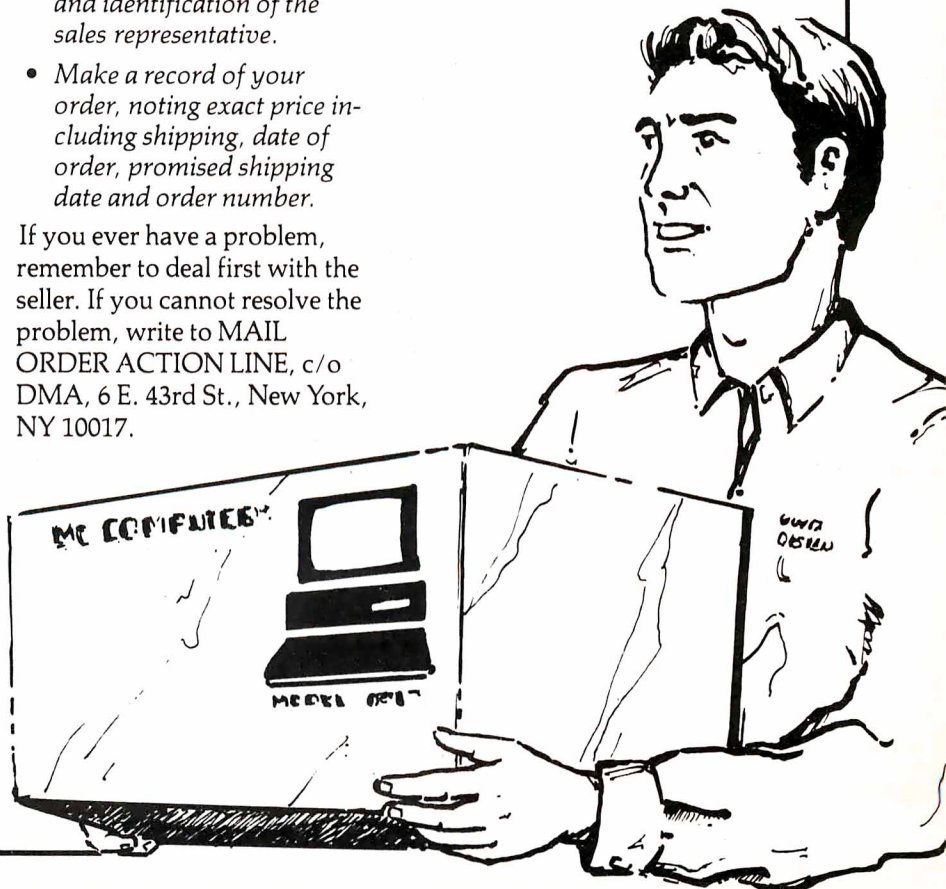
- State as completely and accurately as you can what merchandise you want including brand name, model number, catalog number.
- Establish that the item is in stock and confirm shipping date.
- Confirm that the price is as advertised.
- Obtain an order number and identification of the sales representative.
- Make a record of your order, noting exact price including shipping, date of order, promised shipping date and order number.

If you ever have a problem, remember to deal first with the seller. If you cannot resolve the problem, write to MAIL ORDER ACTION LINE, c/o DMA, 6 E. 43rd St., New York, NY 10017.

This message is brought to you by:

the MICROCOMPUTER
MARKETING COUNCIL
of the Direct Marketing
Association, Inc.
6 E. 43rd St.,
New York, NY 10017

MMC
MICROCOMPUTER
MARKETING COUNCIL
of the Direct Marketing Association, Inc.



Compare Computers Inc.

Orders, Call Toll Free
1-800-888-2983

Tech Support & Information
1-612-881-9197

Mailing Address: 9801 Dupont Ave. So., Suite 175 Bloomington, MN 55431

ORDER DESK & TECHNICAL SUPPORT OPEN: M-F 9a.m.-5p.m. CST

EVEREX

Model 3000A

16MHZ-386

- 64 K Static RAM cache
- 1 MB-100NS Dram
- 1.2 MB Floppy
- Hard drive floppy controller

\$1895.00



EVEREX

Model 1700C

12MHZ-286

- 1 MB 100NS Dram
- 1.2 MB Floppy
- Hard drive floppy controller

\$1295.00



National On-site Warranty Service Available on ALL EVEREX Computers

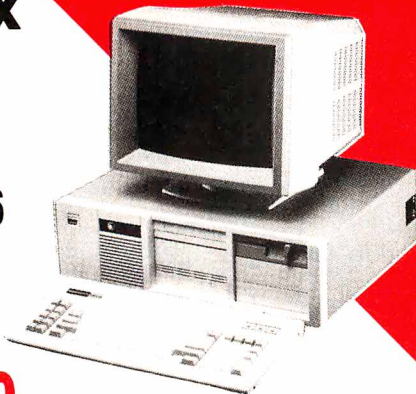
EVEREX

Model 1800

8MHZ-286

- 512 K RAM
- 1.2 MB Floppy
- Hard drive floppy controller

\$869.00



LAPTOPS

NEC Multispeed

EL	1429.00
HD	2359.00

Toshiba

T-1000	799.00
T-1200F	1595.00
T-1200FB	1789.00
T-1200H	2295.00
T-1200HB	2399.00
T-3100/20 (286)	2995.00
T-3200 (286)	3795.00
T-5100 (386)	4829.00



ACCOUNTANT 101 KEYBOARD

Enlarged Enter, Shift, Backspace Key

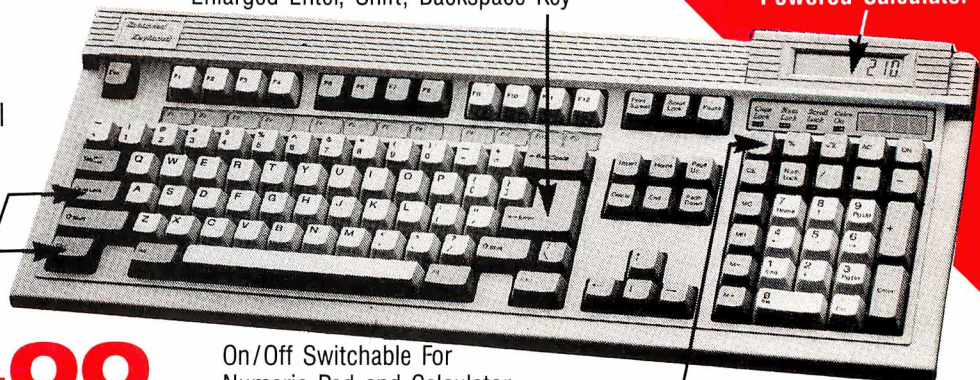
- Tactile/Click Key Switch
- XT, AT and Novell Compatible

Ctrl.
Capslock
Alternative

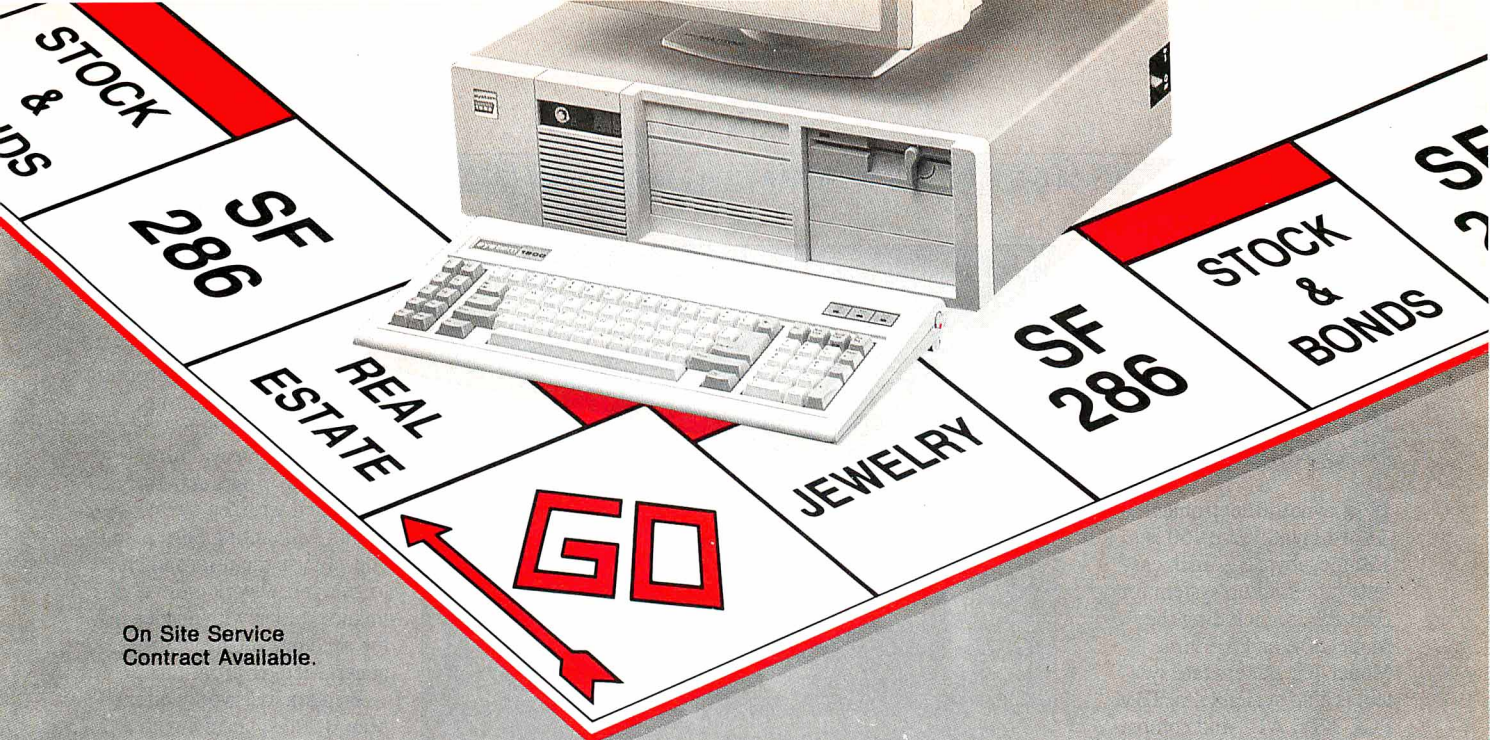
Adjustable Solar
Powered Calculator

\$89.00

On/Off Switchable For
Numeric Pad and Calculator



WE WELCOME EDUCATION AND CORPORATE ACCOUNTS



On Site Service
Contract Available.

Don't Just Buy a Computer Invest in a SF-286

SF-286 (Hard Drives Optional)	8MHz	10MHz	10MHz (0 WS)	12MHz (0 WS)	16MHz (386)
Mono System	\$995	\$1119	\$1349	\$1499	\$2050
EGA System	\$1369	\$1569	\$1720	\$1870	\$2349

Basic System Features:

80286-16 bit CPU, 80287 socket, 512K RAM expandable to 1MB, fully compatible AMI BIOS, 1.2MB Floppy Disk Drive, combined floppy/hard disk controller, Keytronics 101 enhanced keyboard, clock/calendar with battery backup, 195 watt power supply, 48 hour burn-in testing, operations manual, one year limited warranty and optional on-site maintenance agreement.

SF-286-8MHz

20Mb Mono Special.....\$1249

Basic System features plus: Monographics board with printer port, Samsung 12" amber mono monitor and Seagate 20Mb hard drive.

SF-286-8MHz

20Mb EGA Special.....\$1599

Basic System features plus: Everex EGA graphics board, Evervision EGA color monitor and Seagate 20Mb hard drive.

SF-286-8MHz

20Mb VGA Special.....\$1839

Basic System features plus: Everex EVGA graphics board (640x480, 800x600, up to 256 colors), Evervision multisync color monitor and Seagate 20Mb hard drive. Add \$60 for upgrade to Mitsubishi Diamond Scan Monitor.

SF-286-12MHz

20Mb Mono Special.....\$1749

Basic System features plus: Monographics board with printer port, Samsung 12" amber mono monitor and Seagate 20Mb hard drive.

Upgrade to 40Mb Seagate hard drive, Add \$160
Upgrade to 80Mb Seagate hard drive, Add \$449

EGA Bundle.....\$479

Everex EGA autoswitch graphics board and Evervision EGA color monitor.

Super EGA Bundle.....\$579

Everex EGA Deluxe autoswitch graphics board (640x480, 752x410), and Evervision multisync color monitor. Add \$60 to upgrade to Mitsubishi Diamond Scan Monitor.

Super VGA Bundle.....\$709

Everex EVGA graphics board (460x480, 800x600, up to 256 colors) and Evervision multisync color monitor. Add \$60 to upgrade to Mitsubishi Diamond Scan Monitor.

Hard Disk Specials (for PC)

Seagate ST225 20Mb + Controller.....\$265
Seagate ST125 20Mb + Controller.....\$329
Seagate ST238 30Mb + Controller.....\$289
Seagate ST251 40Mb + Controller.....\$449

Hard Disk Specials (for AT)

Seagate ST125 20Mb (40ms).....\$269
Seagate ST138 30Mb (40ms).....\$339
Seagate ST251 40Mb (40ms).....\$369
Seagate ST251-1 40Mb (28ms).....\$429
Seagate 4096 80Mb (28ms).....\$649

Everex Modems

Everex Evercom external and internal modems (fully Hayes compatible) with Bitcom communications software.

Internal 1200 Baud Modem.....\$80
External 1200 Baud Pocket Modem.....\$139
Internal 2400 Baud Modem.....\$149
External 2400 Baud Modem.....\$199

Misc. Specials

Mini I/O (PAR, SER, CLK, CAL).....\$55
Mini I/O with Game Port.....\$65
Mini I/O + Logitech C7 serial mouse.....\$119
Teac 3.5" 720K floppy drive.....\$99
Teac 3.5" 1.4Mb floppy drive.....\$129
150 Watt Power Supply.....\$49
200 Watt Power Supply.....\$79
MS Dos 3.3 with GW Basic.....\$90
3Mb EMS memory board w/ OK (AT).....\$99

Seagate, Samsung, Everex, Evervision, Mitsubishi, Hayes, Bitcom, Logitech, are trademarks or registered trademarks of their respective companies.

SFMICRO5 V.1 10/11/88

SFmicro
1825 Lombard Street
San Francisco, CA 94123

California Orders, Information
(415) 929-1505

National Order Desk (800) 237-5631
Technical Support (415) 929-1607

Hours: M-F, 9 to 5 (PST)

University P.O.'s and Dealer
Inquiries are Welcome

TERMS: We accept MasterCard, VISA (no surcharge), American Express, COD's (Certified Funds) and approved company P.O.'s. California residents please add sales tax. 10% fee for unauthorized returns (call for RMA number). Returns must be shipped freight prepaid by customer. Prices are subject to change without notice. We reserve the right to substitute equivalent items. We are not responsible for typographical errors.

Tape Backups for PC, PS/2 Support SCO Xenix 386

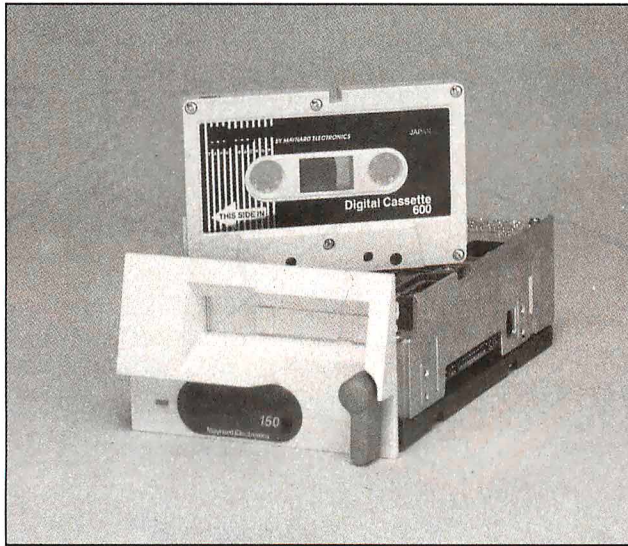
Maynard Electronics' MaynStream 150 is a 150-megabyte 3½-inch cassette tape backup system for IBM PS/2s, including the Model 50Z and the three Model 70s. A separate system is also available for IBM PCs, XT, ATs, and compatibles. The system for the PS/2s supports SCO Xenix 386 version 2.2 and can back up a cassette's worth of data in 24 minutes.

The systems include scripts that let you back up related files as a group, and an archive feature, which transfers inactive hard disk files onto a backup cassette, freeing more space on your hard disk. The systems' read-after-write and error-correction code capabilities can help ensure data integrity. The systems also feature electronic automatic-tension control and direct-drive tape motors.

The MaynStream 150 is a digital data cassette system that uses standard d/CAS-85 tape format and works with most local-area networks, including Novell, 3Com, and IBM's Token Ring, according to Maynard. Both systems include a half-height drive, cables, software, cassettes, and a controller card. The controller card for your PC or compatible occupies a half-length slot, and the PS/2 controller card occupies a full-length slot. To support SCO Xenix 386, Maynard provides driver software that you can install using an auto-configuration routine.

Price: \$1525 for IBM PCs; \$1725 for IBM PS/2s.

Contact: Maynard Electronics, 460 East Semoran Blvd., Casselberry, FL 32707, (800) 821-8782; in Florida, (407) 331-6402.
Inquiry 905.



MaynStream 150 digital data cassette backup system.

Windows-Based Word Processor

Ami is a Windows-based word processor that lets you control more than just the words of your document. You can edit your document in either of two modes: Draft mode is for text-only work, and layout mode lets you edit in WYSIWYG format, complete with on-screen formatting of the document. In the program's layout mode, you can wrap text; control fonts, spacing, and text placement; and set up graphics frames, according to Samna, the program's publisher.

Ami lets you import Samna, WordPerfect, WordStar, and ASCII files or bit-mapped graphics in PCX or Tag Image File Format into the frames, which you can place anywhere in the document. You can scale, reposition, or crop the graphics once you've placed them in the frame.

Word processing capabilities include search and replace; cut, copy, and paste; a 130,000-word spelling checker, an undo command, and headers and footers. You can use the program's prede-

fined style sheets or design the document's layout yourself.

Ami requires an IBM PC AT, PS/2, or 80286/80386 compatible with a Hercules, EGA, VGA, or IBM 8514-A graphics card, 640K bytes of RAM, a hard disk drive, and DOS 3.0 or higher. The program is bundled with a run-time version of Microsoft Windows and can run with a Microsoft or compatible mouse.

Price: \$199.

Contact: Samna Corp., 5600 Glenridge Dr., Atlanta, GA, 30342, (800) 831-9679; in Georgia, (404) 851-0007.

Inquiry 907.

Accounting Software for Quick Print Industry

When a customer comes in with a big printing job, many "quick print" shops do the cost estimating for the job by hand. Because of the rush factor and the number of elements involved, it's often easy to forget to account for the number of copies, color of ink, letterhead, envelope, typesetting, and layout requirements and thus miscalculate the cost. With Printers Inc., you can automate this process.

Once a customer's requirements are entered, the program calculates labor, wash-up, waste, and registration costs and stores it in customizable tables. The program is fully integrated with the Great Plains Accounting Series, so you can use the information to generate a work order and invoice, along with entries in the accounts receivable and general-ledger programs.

Printers Inc. works on the Mac II, Plus, and SE with a 20-megabyte hard disk drive, 1024K bytes of RAM, System 3.2 or higher, Finder 5.3 or higher, and a Imagewriter, LaserWriter, or compatible printer. A recommended starting configuration includes Great Plains' Accounts Receivable (\$795) and Printers Inc.

Price: \$1495.

Contact: Great Plains Software, 1701 Southwest 38th St., Fargo, ND 58103, (701) 281-0550.

Inquiry 915.

Wendin-DOS 2.15 Breaks 32-megabyte Hard Disk Partitions

With Wendin-DOS 2.15, you can create hard disk partitions of up to 4 gigabytes. Based on a VAX VMS kernel, it lets you run most DOS-compatible programs that require less than 340K bytes of memory. The program includes DOS 3.3 extended partition support and improved PIPING and SHELL OUT functionality.

The operating system runs on the IBM PC, XT, AT, and compatibles and requires 300K bytes of memory.

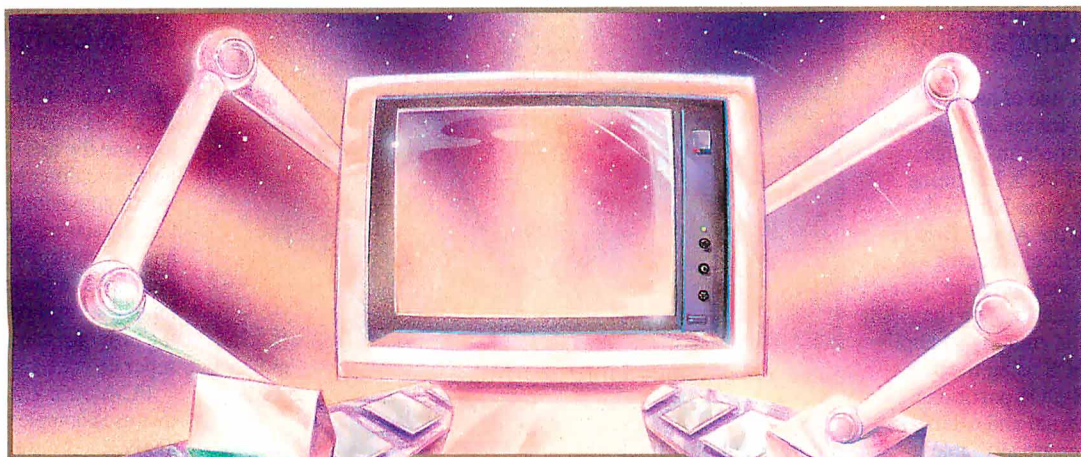
Price: \$139.

Contact: Wendin, Box 3888, Spokane, WA 99220, (509) 624-8088.

Inquiry 913.

NEW!

Turn Your PC Into A Duplicating Machine!



Duplicating is a *snap* with THE DUPLICATOR TOOLKIT! Whether you need to make one copy or 100, this program is for you. It begins where DISKCOPY leaves off!

SUPER SPEED. Copy, compare, verify and format in *less* time than it takes to just copy with DOS!

NO DISKETTE SWAPPING. Make only one copy of the source diskette in RAM while you are duplicating or conveniently store and retrieve it from the hard disk for future duplication.

SUPPORT TWO DISK DRIVES. THE DUPLICATOR TOOLKIT switches from "A" to "B" drives on dual floppy systems for *even faster* copies!

EVERY COPY'S AN ORIGINAL. Multiple verification settings let you choose the level of data checking to ensure reliable copies.

MAKES LABELS TOO! You can even generate labels for each diskette. Optional serialization is included.

YOU'RE KEYSTROKES AWAY FROM PERFECT COPIES! If even a quick guide is too much to read, this is the program for you. Easy on-screen prompts will have you duplicating in *seconds*.

Get the *power* DISKCOPY can't give you. Order today!

MINIMUM SYSTEM REQUIREMENTS: IBM PC, XT, AT or compatible and 256K Ram. PC or MS DOS 2.0 or higher. Hard disk recommended. Not copy-protected.

THE DUPLICATOR TOOLKIT and Copy Technologies are Trademarks of Copy Technologies.

COPY TECHNOLOGIES

14252 Culver Drive, Suite 323
Irvine, CA 92714
(714) 975-1477

Circle 507 on Reader Service Card (DEALERS: 508)



I've had it with DISKCOPY! turn *my* PC into a Duplicating Machine! Please send me:

_____ copies of THE DUPLICATOR TOOLKIT at \$79.95 each plus \$4.50 shipping (\$10.00 Canada and outside U.S.). CA residents please add 6% sales tax.

NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

☐ Check/Money Order

☐ Visa

☐ Master Card

Account Number _____

Exp. date _____

mail coupon to: **COPY TECHNOLOGIES**
14252 Culver Drive, Suite 323
Irvine, CA 92714

Hard Disk System for the Amiga 2000

Supra's line of hard disk drives for the Amiga 2000 lets you connect an Amiga and an IBM PC XT running DOS to the same hard disk drive using the Amiga Bridge-board Interface. Running under that configuration, you can do multitasking on the Amiga while running an application in DOS using the disk drive's MS-DOS partitions.

Both internal and external SupraDrives are available in 20-, 30-, 60-, 120-, and 250-megabyte systems. The internal model comes with a direct-memory interface, disk drive, controller, cables, and screws. To plug in the external drive, you place the Supra interface in an Amiga expansion slot and plug in the hard disk drive. CLIMATE, a command-line interpreter, is also included.

Supra Interface Kits are also available for those who already have a hard disk drive and want to mount it internally. The kits are available with or without controllers.

Price: SupraDrive Hard Disk Systems: from \$699 for the 20-megabyte system to \$3995 for the 250-megabyte system.

Supra Interface Kits:

\$399.95 with controller;

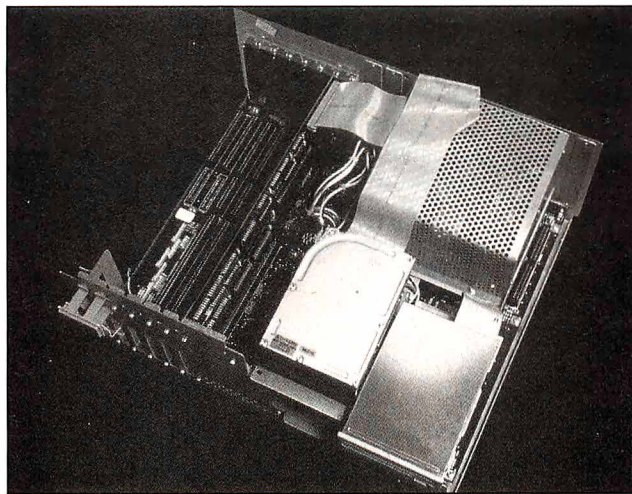
\$249.95 without controller.

Contact: Supra Corp., 1133 Commercial Way, Albany, OR 97321, (800) 727-8772; in Oregon, (503) 967-9075.

Inquiry 917.

Enhancement for DOS Command-Line Interface

Enhance! 1.1 is a memory-resident program that adds several features to DOS without supplanting DOS's COMMAND.COM functions. You can load and run the



Supra's double-duty hard disk drives.

program in Lotus-Intel-Microsoft Expanded Memory.

The program, which is not menu-driven, includes these enhancements: The ability to correct a lengthy command's typo with four keystrokes; display the last 20 commands entered; save current drive/directory locations, switch to other drives/directories, and return to saved location by pressing the RETURN key; type several commands without entering them until you want to send them to DOS one at a time; display a sorted list of all files changed or called in a day; and copy all files on drive C changed within a week to drive D.

You can also use it to display your hidden files in current and \BIN directories, prevent someone from undeleting your deleted files, change the time and date associated with a file to current time and date, and more.

Enhance! 1.1 runs on the IBM PC, XT, AT, PS/2s, and compatibles and requires 256K bytes of RAM and DOS 2.0 or higher.

Price: \$79.95.

Contact: Cortex Computing Corp., P.O. Box 116788, Carrollton, TX 75011, (214) 492-5124.

Inquiry 914.

Give Commands with Single Keystrokes

Dos-Mate is an ASCII-based shell for PC users that lets you execute DOS commands such as Copy, Delete, MAKEDIR, REMDIR, EDLIN, and other file management commands with a single keystroke. The program displays help and status information at the top of the screen, while a 14-character column on the right side gives a directory of your files and subdirectories.

You can also use Dos-Mate to make, remove, change, and delete directories on your hard disk drive. The program has a built-in editor that's as powerful as WordStar, according to publisher Intuitive Software. You can also use the program to hide and protect files and directories protected under password protection.

Dos-Mate runs on IBM PCs, XTs, ATs, PS/2s, and compatibles and requires 40K bytes of RAM and DOS 3.0 or higher. The program works with Hercules, CGA, VGA, EGA, and MCGA cards.

Price: \$49.95

Contact: Intuitive Software, P.O. Box 6041, Bozeman, MT 59715, (406) 587-3348.

Inquiry 851.

Analyze Source Code Complexity

A program developed by SET Laboratories to determine the difficulty level of understanding, testing, and modifying another program's source code can now analyze multiple programs per run. If a project is divided among several programmers, the program can analyze the separate files as one unit.

PC-Metric 2.0, a program that uses complexity metrics to analyze a program's source code, also has a bridge that lets you analyze the program's output using Lotus 1-2-3's statistical and graphics capabilities.

The program uses techniques such as the Cyclomatic Complexity and the Software Science measures to report on the likely number of programming errors in the code, amount of required time to write a program, and difficulty of working with the code. By analyzing multiple programs per run, PC-Metric 2.0 can take a program that's been segmented among several programmers and analyze the program as one file, SET Laboratories reports.

Versions are available in C, Pascal, COBOL, Modula-2, and FORTRAN. All versions run on IBM PCs, XTs, ATs, and compatibles with DOS 2.11 or higher and 256K bytes of RAM. The program also requires Lotus 1-2-3 or a compatible spreadsheet to use the 1-2-3 bridge.

Price: \$199 per language.

Contact: SET Laboratories Inc., P.O. Box 03627, Portland, OR 97203, (503) 289-4758.

Inquiry 853.



JASMINE COMPUTER SYSTEMS

XT-3000 BY SAMSUNG

\$699.00

- Small Footprint • Phoenix BIOS
- 8088-2 Turbo 4.77-8 MHz (SI 1.7)
- 512k RAM Expandable To 640k
- 1 360 Floppy drive w/Controller
- Parallel, Serial Port, Clock/Calendar
- MS-DOS 3.2/GWBasic • UL/CSA Approved

XT-SYSTEM

\$549.00

- 4.77 /10 MHz 0 Wait
- 256K RAM up to 640K
- 1-360K floppy drive
- Floppy controller
- Math co-processor slot
- 150 Watt power supply (UL)
- 101 Enhanced keyboard
- Lock/Led/Reset/turbo case
- Mono. monitor (tilt & swivel)
- Monochrome graphics adapter
- All Systems FCC Class B approved

286-10 SYSTEM \$999.00

(Optional 12, 16, 20 MHz)

- 6 /10 MHz
- 512K RAM up to 4MB
- 1-1.2MB floppy drive
- Harddrive/Floppy controller
- Math co-processor slot
- 200 Watt power supply (UL)
- 101 Enhanced Keyboard
- Lock/Led/Reset/Turbo case
- Parallel, Serial Port, Clock/Calendar
- All Systems FCC Class B approved
- Mono. monitor (tilt & swivel)
- Monochrome graphics adapter

286-12 SYSTEM \$1099.00

386-16 SYSTEM \$1999.00

(Optional 20 MHz)

- 8 /16 MHz 0 Wait
- 1,024K RAM up to 2,048K
- 1-1.2MB floppy drive
- Harddrive/Floppy controller
- Math co-processor slot
- 200 Watt power supply (UL)
- 101 enhanced keyboard
- Lock/Led/Reset/Turbo case
- Parallel, Serial Port, Clock/Cal
- Monochrome graphics adapter
- All Systems FCC Class B approved
- Mono. monitor (tilt & swivel)

XT-COMPLETE \$645.00

- Complete with XT-SYSTEM Plus:
- 256K RAM (Total 512K)
- Parallel, Serial, Game port, Clock/Calendar
- All Systems FCC Class B approved

SEAGATE HARD DRIVE INSTALLED ADD:

20 MB 65 MS (ST-225)

XT: \$299.00

AT: \$275.00

30 MB 65 MS (ST-238)

XT: \$349.00

AT: \$349.00

40 MB 39 MS (ST-251)

XT: \$499.00

AT: \$425.00

**MONOCHROME TO CGA COLOR SYSTEM
MONOCHROME TO EGA COLOR SYSTEM**

ADD: \$199.00

ADD: \$399.00

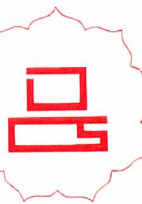
MANAGER SPECIAL

300 WATT 150VA-HOUR UPS Battery back-up with surge & filter\$299.00

300 WATT 150VA-HOUR POWER CENTER with UPS surge & filter..... \$335.00

TAESUNG INDUSTRIES, INC.

Most items are ready for shipping within 24 hours. No shipping charge added with cash prepayment. 3% surcharge for visa and mastercard; 1 year parts and labor warranty; 24 hours turn around service; some areas on site service available; 30 days refund policy; all machines have been burned in 72 hours. Free software with any purchase. Business hours 9:00-6:00, Mon.-Sat.



1-800-848-1003 (Order Line)

1-800-222-4160 (Dealers)

JASMINE COMPUTER SYSTEMS

P.O. BOX 755 • 100 MAIN STREET
SALEM, NH 03079

(603) 893-3332

(617) 682-5953

Add Serial Ports to Your PC

PC users are finding more and more uses for their machines these days—desktop publishing, telecommunications, and networking, to name a few. But with the increasing capabilities, the number of peripherals you can attach to your PC can exceed the number of unused serial and parallel ports. Boca Research has introduced the IO/AT, an expansion board that has two options: the IOAT41, equipped with a 25-pin parallel and 9-pin serial port; and the IOAT42, with both ports plus an additional 25-pin serial port.

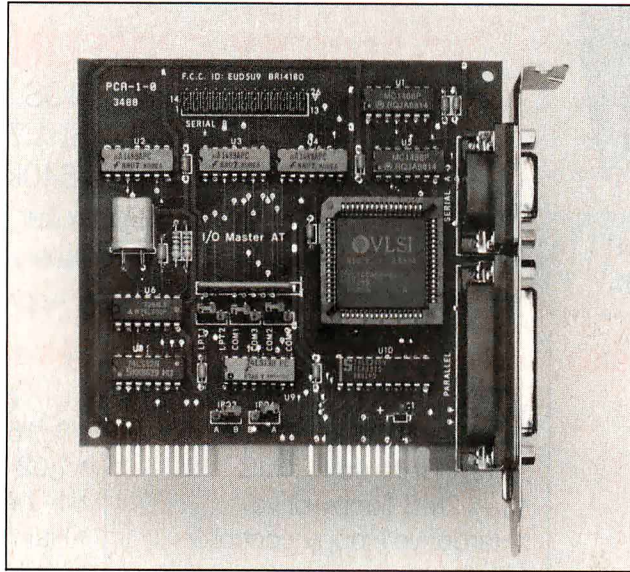
Running with two IO/AT boards in tandem, your PC can support as many as four additional serial ports and two additional parallel ports, enough to run any device-dependent system, the company reports. Boca designed the board to run specifically with the IBM AT—the board uses a very-large-scale-integration high-speed universal asynchronous receiver/transmitter NS16450-compatible chip—but it will run on other machines, too.

The short card (4½ by 4½ inches) connects to any AT or 8-bit PC-style bus. No additional software is required (you implement the board with jumper settings). Both cards work on the IBM PC, XT, AT, PS/2 Models 25 and 30, and compatibles.

Price: IOAT41, \$119; IOAT42, \$129.

Contact: Boca Research, Inc., 6401 Congress Ave., Boca Raton, FL 33487, (407) 997-6227.

Inquiry 911.



Boca Research's IOAT41 in a 25-pin/9-pin configuration.

Corporate Environment Manager

Hardly a month goes by without corporate executives having to hear or deal first-hand with the following horror stories: A disgruntled employee gets fired and destroys the last six months' worth of payroll files; workers are making unauthorized copies of expensive commercial or proprietary software for personal use; or someone uses an unauthorized public domain program infected with a virus that corrupts the company's valuable files. FoundationWare's Vaccine Corporate 2.1 can prevent these and other mishaps, the company reports.

A system manager can install the program and designate which company-approved commercial and proprietary software can run on company PCs. A 5K-byte memory-resident module intercepts any attempt to write directly to hard disk drives, and a 1K-byte memory-resident and disk-resident module checks each program and selected files for signs of tampering. A special disk, called the Blue Disk, is avail-

able with a database of signature checks for over 5000 certified virus-free public domain and shareware programs.

Vaccine Corporate 2.1 runs on the IBM PC, XT, AT, PS/2s, and compatibles with 384K bytes of RAM and DOS 3.0 or higher. A hard disk drive and a floppy disk drive are required.

Price: \$189.

Contact: FoundationWare, 2135 Renrock Rd., Cleveland, OH 44118, (800) 722-8737; in Ohio, (216) 932-7717.

Inquiry 912.

Visualize Data with Perceptual Mapping

Mapwise is a statistical program for marketing, research, and advertising companies that describes data relationships with a perceptual map and creates scattergrams. You can use the scattergrams in presentations as a visual description of your statistical market data.

According to the program's publisher, you can also

use Mapwise to assess advertising effectiveness, position products, describe benefit segments, measure brand loyalty, target new products, and more.

Mapwise formats up to 10,000 numbers in a data file, and it summarizes up to 96 tables and up to 100 rows and 100 columns of data with one map. The program automatically tests for data significance.

Mapwise runs on the IBM PC, XT, AT, PS/2s, and compatibles with 256K bytes of RAM. The program can also import ASCII and Lotus 1-2-3 data files.

Price: \$495; \$9.95 for limited feature version.

Contact: Market Action Research Software, Bradley University, Business Technology Center, Peoria IL, 61625, (309) 677-3299.

Inquiry 909.

Analyze Transfer Functions to the Fifth Order

Transfer Function Analysis can analyze transfer functions and polynomials up to the fifth order. It can list, plot, or file magnitude and phase versus frequency in both logarithmic (Bode) and linear ranges.

The program's full-screen displays with protected fields allow for coefficient entry and update.

Transfer Function Analysis works on the IBM PC, XT, AT, PS/2s, and compatibles and requires 64K bytes of RAM, DOS 2.0 or higher, and a CGA, EGA, or VGA graphics card. IBM monochrome graphics is not supported.

Price: \$40.

Contact: CastleSoft, 990 Oakwood, Castle Rock, CO 80104, (303) 688-2954.

Inquiry 908.

SHORT TAKES

BYTE editors offer hands-on views of new products

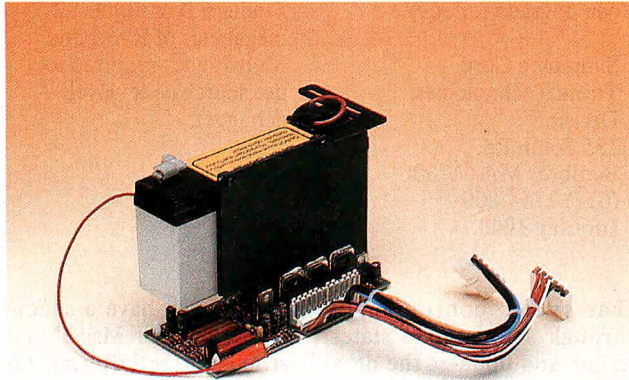
Boomerang

Think C

SOTA 286i

ALPS Allegro 24

FamilyCare Software



should have a second battery (\$50), which fits piggyback on the first. This makes things even tighter.

Once Boomerang is installed, you'll have to get used to the strange sensation of not having your computer turn off when you turn off your system's power switch.

Boomerang is a reasonably priced and eminently useful add-in to any PC. And if you live in an area that has frequent power burps, it can save your sanity.

—Stan Miastkowski

Boomerang Makes Your System Bounce Back

While the overall reliability of computers and peripherals has continually gotten better, there's not as much you can do about one part of your system, namely, the AC power. Surge protectors and RF filters make the power smoother, but you're up the creek if nothing is coming out of the wall.

Backup power supplies are one solution. They're essentially high-capacity batteries with enough juice to power your computer for 10 to 20 minutes. However, they're big, they're expensive, and they don't help much if the power fails when your computer is working unattended.

There must be a better way, and MicroSync has a unique solution in a product called **Boomerang**. You might think of it as a miniature backup power supply. But it's much more than that, with a few tricks up its electronic sleeve.

Boomerang consists of a circuit board, a lithium battery, and a few connectors. Measuring 5½ by 3¼ by 3¼ inches overall, Boomerang is designed to fit *inside* your system unit. Using a cleverly designed bracket, it hangs in that previously unused dead space between the power supply and the expansion slot area.

With its small battery, Boomerang obviously isn't designed to be a full-fledged backup power supply. And it isn't. It works in concert with RAM-resident software. As soon as Boomerang detects a loss of AC power, the software saves an image of your RAM on your hard disk, parks the disk heads, and shuts down the system. This usually takes less than 30 seconds, depending on whether you're using extended or expanded memory, and it's all done automatically.

When the power comes back and your system reboots, you just type a command, and your system is returned to the exact place it was when the power failed. You can even place the command in your

AUTOEXEC.BAT file, letting you automatically return every time to where you were the last time you turned off your computer.

Boomerang takes some time and a modicum of skill to install. You need to connect the unit between your power supply and motherboard, as well as place a jumper into a terminal of one of your expansion slots. Though I consider myself hardware-savvy, I had a difficult time interpreting the wordy installation instructions. A few well-placed illustrations would have made the process considerably easier.

The fit is relatively tight, and if you're using an IBM PC AT or compatible, you really

THE FACTS

Boomerang
\$299; extra battery (for AT or compatible), \$50

Requirements:
IBM PC, XT, AT, or compatible, 256K bytes of RAM, internal hard disk drive, and MS-DOS 2.1 or higher.

MicroSync
15018 Belay Dr.
Dallas, TX 75244
(214) 788-5198
Inquiry 1001.

Thinking of a Mac C Environment? Think of Think C

Think Technologies introduced its Lightspeed C compiler for the Macintosh in 1986. It featured a novel integrated environment that combined the editor, C compiler, object linker, and resource linker in one application module. It supercharged a programmer's edit-compile-link development cycle, producing tight, fast code to boot. And as

icing on the cake, it cost only \$175. Things have changed since then: We've got the Mac Plus, Mac SE, and Mac II computers. We also have several new software managers, color, and MultiFinder.

Think Technologies (now owned by Symantec) has managed to keep pace with these new developments by providing free updates to Lightspeed

C owners via commercial online systems and bulletin boards. However, it reached the point where a major upgrade of the compiler was in order. The company has responded to the need for change with Lightspeed C 3.0, which is now called **Think C**.

The new compiler features user-selectable 68020 and

continued

68881 code generation, supports the latest MultiFinder and Color QuickDraw traps, and generates debugging information for MACSbug or TMON. When you build an application, you can specify its MultiFinder attributes (i.e., MultiFinder-aware, Can background, and Accept suspend/resume events) and its memory partition size.

But the biggest news is that Think C sports a source code-level debugger. It lets you single-step through your C code in a source window while dynamically displaying the contents of variables or structures you've selected in a second data window. This feat is accomplished by running the debugger application in tightly coupled control with your application as it runs with Think C under MultiFinder.

Think C operates comfortably in 1 megabyte, but you'll need 2 megabytes of RAM to support the MultiFinder/debugger environment. Perhaps the best part is that Think C still costs only \$175.

You can point and click on source code statements in the debugger's source window to set/reset breakpoints or to help set conditional breakpoints. You can single-step or trace into or out of functions either by clicking buttons on this window or by using a menu selection. An arrow in the source window points to the statement that's currently being executed.

The debugger's data window lets you examine variables in the format you specify (i.e., hexadecimal, decimal integer, pointer, floating-point, address, or char). You can even examine the fine detail of structures by entering the appropriate C syntax statements.

For example, the statement `(**the_Palette).pmInfo[count].cIRGB.red` lets you look at the contents of the red component of a particular palette entry as determined by the value in `count`. For complicated looping functions, you use an automatic mode feature

THE FACTS

Think C (Lightspeed C 3.0)
\$175 (registered users can upgrade for \$69)

Symantec Corp.
Think Technologies Division
135 South Rd.
Bedford, MA 01730
(617) 275-4800
Inquiry 1000.

that cycles continuously through source code statements and updates the data window as the variable contents change.

I tried the debugger on a Mac II with 2 megabytes of RAM and two color monitors: an AppleColor 13-inch monitor and Mac II video board, and a SuperMac 19-inch monitor and Spectrum/24 video board. I also tried it on a Mac Plus with 2 megabytes of RAM to see how well the debugger fared on a typical low-end machine.

On the large SuperMac screen, you get generously sized source and data windows. On the Mac Plus, these windows are cramped, but you can resize them to make it

Requirements:
Mac Plus, SE, or II running System 4.3/ Finder 6.0 or higher; 2 megabytes of RAM and MultiFinder required to use source code-level debugger.

work. If you have a second monitor on your Mac II, you can redirect the debugger windows to it so that you can observe your program's output without the screen becoming cluttered with debugging information. This feature worked reliably no matter which monitor I used for the debugging output.

The debugger worked admirably on both machines, and it let me find some problems I'd been having with a program within a matter of minutes—simply because I could see what was happening inside it.

Think C comes with two softbound manuals: a user's manual and a libraries reference. The user's manual pro-

vides good information on how to call Mac Toolbox routines. Unfortunately, the libraries manual provides information only on the standard Unix-style C library functions. I sorely miss having the list of Toolbox calls and their Think C calling conventions that were available in the version 1.0 manual. And I still wish the compiler would give an assembly language listing, for help in those nasty debugging situations where the source code won't do or can't be used (the debugger works only on application programs).

One thing you can't do is restart the debugger once you've reached the end of an interesting trace. You must exit the debugger, which in turn loses all your data window tracing information. Think Technologies is working on a way to save this information so that you can reenter the debugger without having to reenter the data. This is the only glitch I found marring the stellar performance of an already excellent development language. If you want a powerful C compiler with a good debugging tool, at a cost that won't blow your budget, Think C is the one to buy.

—Tom Thompson

SOTA 286i Turns Dinosaur into Ripsnorting Demon

So what if I work for a magazine at the cutting edge of personal computing technology—my old Tandy model 1200 HD is just fine by me. The 8088 processor is steady and reliable, and I've heard too many horror stories about accelerators gunking up people's systems because of some indeterminate incompatibility. After all, this old Tandy has never let me down, and I've been using it day in and day out for 3 years. But when we received a **SOTA 286i** universal accelerator board containing a 12.5-MHz 80286 and the company promised it

would be easy to install and sure to work, I decided to give it a shot.

Putting the 286i into the Tandy was about as tough as changing the oil filter on a car, but much cleaner. I slipped off the case, removed the 8088 from the motherboard, stuck it into its slot on the 286i, ran a supplied ribbon cable from the 8088's old socket to a spot on the SOTA board, and then put the 286i into a slot (it will fit in a long or short slot).

I was able to boot the Tandy in 8088 mode and then, by throwing a toggle switch that sticks out of the back of the

machine, boot up in 80286 mode. But that 80286 mode is pretty meaningless without installing the accompanying software driver.

When I installed the driver program and ran my most commonly used software, the difference in speed was remarkable. XyWrite, which used to chug into memory, now loads visibly quicker, and operations like formatting files are almost instantaneous. Procomm fetches material for uploads to BIX fast enough to simulate use of a 2400-bit-per-second modem.

continued



Embedded systems designers have already used CrossCode C in over 291 different applications.

CrossCode C comes with four powerful tools to help you program your 68000-based ROMable applications

From C source to final object, each tool takes you one step closer to your finished ROMable design

CrossCode C is designed specifically to help you write ROMable code for all members of the Motorola 68000 family. Four powerful tools take you from C source to object code:

1. COMPILER: To get truly ROMable code, you have to start with a truly ROMable compiler. Here are three CrossCode C features that you won't find in any ordinary C compiler:

- Compiler output code is split into five independent memory sections that you can assign into ROM or RAM as you please.
- You can optimize the code for your application because *you* control the sizes of data types. For example, you can optimize for speed by using two byte *ints*, or get maximum versatility by using four byte *ints*.
- You can easily write assembly language routines that call C functions and vice versa, because the compiler uses simple, well documented parameter passing conventions.

2. ASSEMBLER: CrossCode C comes with a Motorola-style assembler that has all the features that assembly language programmers require. In fact,

you could write your whole application with it:

- The assembler features an advanced macro language, conditional assembly, "include" files, and an unlimited size symbol table.
- Detailed cross references show you where you've defined and referenced your symbols.
- After a link, you can actually convert your "relocatable" assembler listings into "absolute" listings that contain absolute addresses and fully linked object code.

3. LINKER: The CrossCode C linker is designed to handle truly huge loads. There are no limits on the number of symbols in your load or on the size of your output file. And you can always count on full 32 bit target addressability, because the linker operates comfortably in the highest ranges of the 68020's address space.

4. DOWNLOADER: CrossCode C comes with a *downloader* that puts you in touch with all EPROM programmers and emulators. It can convert your load into Motorola S-Records, Intel Hex, Tek Hex, Extended Tek Hex, and Data I/O ASCII

Hex. You can also produce a binary image and convert that image into any format you might want. In all formats, bytes can be split into EPROMs for an 8, 16, or 32 bit data bus.

Why Wait

Once you start using CrossCode C, you may just wonder how you ever got the job done before! It's available under MS-DOS for just \$1595, and it runs on all IBM PCs and compatibles (640K memory and hard disk are required). Also available under UNIX & XENIX.

CALL TODAY for more information:

1-800-448-7733
(ask for extension 2002)

Inside Illinois or outside the United States, please dial

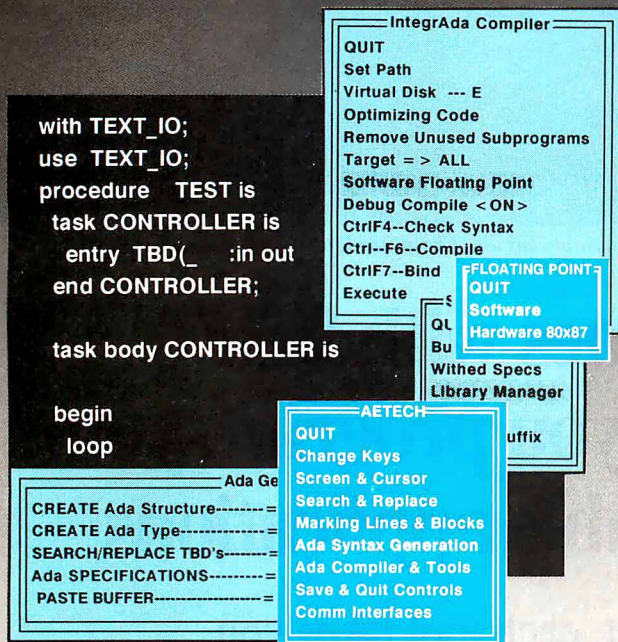
PHONE: 1-312-971-8170
FAX: 1-312-971-8513

SOFTWARE DEVELOPMENT SYSTEMS, INC.
DEPARTMENT 22
3110 WOODCREEK DRIVE
DOWNERS GROVE, ILLINOIS 60515 USA

CrossCode™ is a trademark of SOFTWARE DEVELOPMENT SYSTEMS, INC. MS-DOS® is a registered trademark of Microsoft. UNIX® is a registered trademark of AT&T. XENIX® is a registered trademark of Microsoft.

IntegrAdaTM

...the first completely integrated Ada Programming Support Environment priced for the individual programmer on a PC. Designed for the novice as well as the software engineer.



- Validated Production Compiler
- Use on 8086,80186,80286,80386.
- Full 640KB .EXE Programs
- No Extra Memory Required
- No Math Coprocessor required.
- On-Line Library Management
- Math, Text, Console Packages included
- Multiple File Code Retrieval
- Full-Color, Full Featured Editing
- Selectable Function Keys
- Ada Subprogram and Package Generation
- Ada Type Generation
- Ada Sensitive Cursor
- Interactive Cursor Error Correction
- Interface to Ada Design Language (ADADL)
- Ada Standard Pretty Printer
- DoD 2167 Documentation Features
- Optional On-Line Ada Training Course
- No Run-Time Royalties

Introductory Offer \$495.00

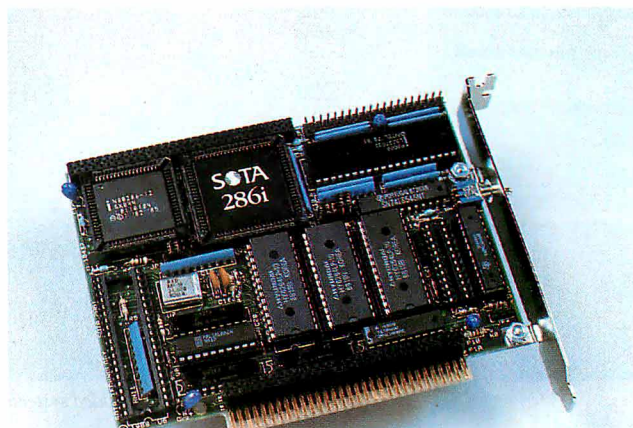
"... the first choice among the half dozen or so compilers now on the market".---PCWEEK

AETECH 380 Stevens Avenue, Suite 314, Solana Beach, California 92075 USA

(619) 755-1277

FAX(619) 755-7540

AETECH



What's going on here is the 286i running the programs with no wait states on most read and write cycles.

There's also a 16K-byte memory cache built into the board. SOTA says the cache hit rate with its proprietary approach is 95 percent on the average. A driver that comes with the board lets you enable the cache to work with the hard disk and video BIOS. If for some reason you want to slow it down to approximate 8088 speed for timing-dependent programs, you can do so easily from the keyboard (it takes only three keys).

SOTA rightfully warns about potential problems with caching on video RAM and the hard disk BIOS, but I didn't have any trouble with the Tandy system. There's also a RAM disk driver included in the software; the driver supports conventional and expanded memory.

Accelerator boards that soup up 8088- and 8086-based computers are plentiful, but I haven't seen one yet that's easier to hook up than the 286i. It took just a little more than a half hour to put the board in and install the software. I didn't have to mess with anything else, but you might have to make a few adjustments, depending on what brand of 8088- or 8086-based computer you have (SOTA notes a few minor tunings that have to be made with the AT&T 6300 and

THE FACTS

SOTA 286i
\$595 for 12.5-MHz version; \$495 for 10-MHz version

Requirements:
8088- or 8086-based computer with at least 64K bytes of available memory for the 286i, an expansion slot, and about 5 watts of power.

SOTA Technology, Inc.
657 North Pastoria Ave.
Sunnyvale, CA 94086
(408) 245-3366
Inquiry 1002.

Zenith machines). The 286i works with the Lotus/Intel/Microsoft Expanded Memory Specification, SOTA says, but I didn't test this capability. The replacement board also has a socket for an 80287 math coprocessor.

The Norton SI program said the 286i makes the Tandy 1200 about 11 times faster than it normally is. Numbers like that sound almost meaningless until you run some applications. I prefer a real-world test like the Cup of Java benchmark: Operations that used to take long enough for me to go fetch a cup of coffee now are finished before I can even get out of my chair.

—D. Barker
continued



COMPUTERS FROM IOWA SURPASS ALL OTHERS!

Gateway 2000 has unsurpassed systems, at incredible prices, backed with our excellent service.
As noted by our customers:



"We are very happy that our system is at the top of the stack in both price and performance, but it is your courteous service that is uncontested by the competition."

— Pierce Haviland — Kingston, NY

"Overall, I feel that your product is outstanding and your service has been excellent."

— Eric Shogren — Stonington, CT



12 Mhz 286 EGA

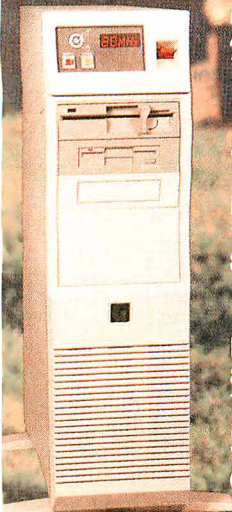
512K 80NS Ram
Expandable to 4 Megs on MB
1.2 Meg 5 $\frac{1}{4}$ " Drive
1.44 Meg 3.5" Drive
40 Meg Hard Drive
1 to 1 Interleave
14" EGA Monitor
EVEREX EGA CARD
1 Parallel / 2 Serial Ports
101 Key Keyboard
MS DOS w/GW Basic

\$1895.00

16 Mhz 286 VGA

1 Meg 70NS Ram
0 Wait State S.I. 17.3
1.2 Meg 5 $\frac{1}{4}$ " Drive
1.44 Meg 3.5" Drive
40 Meg Hard Drive
1 to 1 Interleave
EVEREX VGA Board
Paper White VGA Mon.
1 Parallel / 2 Serial Ports
101 Key Keyboard
MS DOS w/GW Basic

\$2295.00



20 Mhz 386 VGA

1 Meg 60NS Ram
1.2 Meg 5 $\frac{1}{4}$ " Drive
1.44 Meg 3.5" Drive
80 Meg Hard Drive
1 to 1 Interleave
EVEREX VGA Board
14" Multisynch Monitor
800 x 600 Resolution
1 Parallel / 2 Serial Ports
101 Key Keyboard
MS DOS w/GW Basic
80287 and 80387 Sockets
Tower Case

\$3795.00

Call for 25 Mhz option

**Same 386 as shown
but mono desktop.**

\$2995.00



Steve Apiki & Stanford Diehl
Oct. 1988, **BYTE**
Review of 20 386

- "Emerging as truly exceptional..."
- "The Gateway delivers speed without sacrificing features."
- "The system ran without a glitch."
- "We were truly surprised to see a system of this caliber selling for less than \$3000."
- "When evaluating the whole package, The **GATEWAY 386** surpasses all the others!"

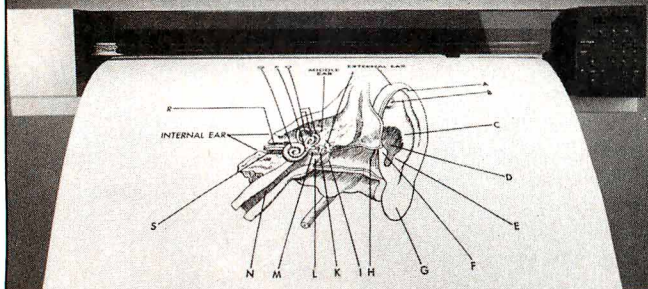


Gateway 2000 • P.O. Box 2000 • Sgt. Bluff, IA. 51054

800-233-8472/712-943-2000

All systems have a 30 day Money Back Guarantee and 1 Year Warranty.
Due to the Volatility in the DRAM Market all prices subject to change.

Our New Plotter Was Designed To Satisfy These Specs.



The SP2800 \$5,795.
The SP1800 \$4,695.

Encad's SP2800 CAD-compatible plotter delivers clean, whisper-quiet, 8-pen drawings on film, paper, or vellum media from A to E size. Like our A to D size SP1800, it's the ideal plotter for architectural, engineering and scientific drawings. HPGL compatible, these plotters work with AutoCAD, VersaCAD and all

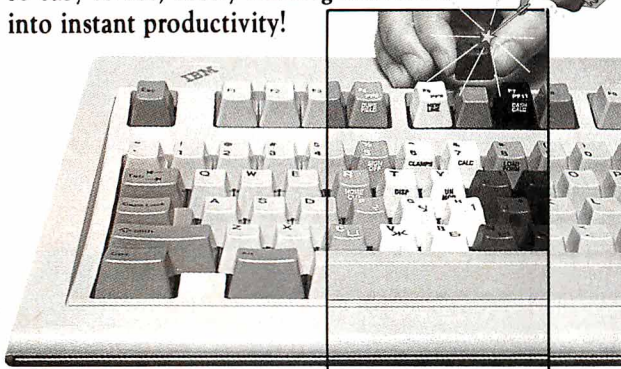
other CAD software packages. And, both feature our 2-Year/1000 Hour Warranty.

To find out more and locate the dealer nearest you, call: 1-800-356-2808.

encad
PLOTTERS®
We've drawn
the line on noise.

Custom Key Imprinting

Create a keyboard
so easy to use, costly training time turns
into instant productivity!



Custom Keys and Snap-On IBM KeyCaps: Available in a wide variety of colors and imprinted in your choice of colors and fonts. Keytop and Keyfront **Labels:** Supporting emulation, word processing or custom made to your specs. Won't wear out or come off keys until intentionally removed. **FlexShield Keyboard Protectors:** Extend keyboard life. Protect from dirt, liquid and damaging environments without restricting keyboard operation. Call for your **FREE CATALOG** of Custom Keyboard Enhancements.

CATALOG HOTLINE: 800 628-2828, Ext. 650

Hoooleon
CORPORATION

For orders or custom info, call:
602 634-7515
FAX: 602 634-4620

P.O. Box 201, Dept. BYTE, Cornville, AZ 86325

Flatbed 24-pin Printer Handles Paper Better Than Print

The ALPS Allegro 24 is a \$499 24-pin dot-matrix printer that goes head-to-head with other low-cost 24-pin printers, like the Epson LQ-500 and the NEC P2200 (see the April BYTE for a review of 24-pin printers). The ALPS unit, though, takes a different approach to paper handling and to printing; as a result, it exceeds at one and falls short at the other.

The Allegro 24 comes with four resident fonts, which can be selected from the front panel, and a 7K-byte RAM buffer (expandable to 32K bytes). An optional cartridge provides three additional fonts. Character pitch and proportional spacing are also selected from the front panel. The Allegro 24 uses its memory rather than DIP switches for storing default settings. These can be easily modified in the printer's memory mode, which lets you change settings by pressing selection buttons on the front panel. The Allegro 24 emulates Epson LQ-500 commands and control codes.

The Allegro 24 performs comparably to other low-cost 24-pin printers. In draft mode, using the same test as in the April article, the Allegro printed about 85 characters per second (substantially lower than the 180 cps that ALPS claims). The Epson LQ-500 printed 100 cps using the same file. In letter-quality mode, the Allegro printed 39 cps versus 44 cps for the LQ-500. The NEC P2200 printed

at almost the exact same speed as the Allegro 24 in both draft and letter-quality modes.

The print quality of the Allegro 24 leaves something to be desired. In draft mode, the quality is inferior to that of my 9-pin IBM Proprinter. In letter-quality mode, the print is comparable to that of a good electric typewriter, but the density is not uniform. I would say that the suspended head does not print as consistently as the more standard platen-based design. Also, the somewhat precarious ribbon probably contributed to the unsatisfactory print quality.

What differentiates the Allegro 24 from its competition is its flatbed paper guide. Instead of traveling around a platen, the paper in this unit travels straight across the bottom of the printer, with the print head suspended above the paper. ALPS claims that this design virtually eliminates paper jams and lets you use a greater variety of paper thicknesses. The paper loads easily in the front of the printer. The Allegro has fold-up legs that raise the printer enough to store about 2 inches of pin-feed paper beneath it.

The Allegro 24 has some good paper-handling features, like forms parking and automatic tear-off positioning. The forms-parking feature lets you "park" pin-feed paper while you're printing single sheets or envelopes. But I hit my first snag with the Allegro 24 using this feature. While the flatbed design may be good for paper handling, the suspended print head is very sensitive to paper thickness. I found that switching from standard pin-feed paper to a standard envelope required an adjustment of the paper-thickness lever. Otherwise, the envelope would push the ribbon out of its guide next to the print head. In fact, it was

continued

THE FACTS

ALPS Allegro 24
\$499

ALPS America
3553 North First St.
San Jose, CA 95134
(408) 432-6000
Inquiry 1004.

A hard disk crash can happen at any time. What might have been an inconvenience any other night is a disaster tonight.

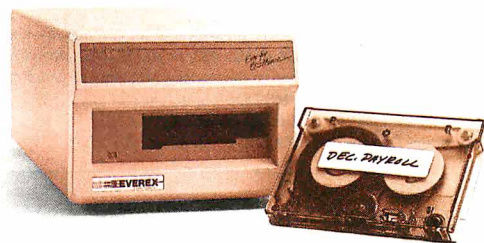
At Everex, we know that lost data can mean

'Twas the
night before
Christmas...

more than
just time
and money.
Which is
why we
make a

complete line of reliable
tape backup systems. We
don't compromise on the
details, because there's too
much to lose.

Everex tape backups.
Because you can't always
save the day just by
working into the night.



EVEREX

48431 Milmont Drive • Fremont, California

1-800-821-0806
1-800-821-0807 in California
Circle 102 on Reader Service Card (DEALERS: 103)

Want to save Time, Money,
& Headaches?



GET SUPERSOFT'S SERVICE DIAGNOSTICS

All the software, alignment diskettes, parallel/serial wrap-around plugs, ROM POSTs and extensive, professional documentation to provide the most comprehensive testing available for IBM PCs, XTs, ATs and *all compatibles* under DOS or Stand Alone. No other diagnostics offers such in-depth testing on as many different types of equipment by isolating problems to the board and chip level.

NEW: SuperSoft's ROM POST performs the most advanced **Power-on-Self-Test** available for system boards that are compatible with the IBM ROM BIOS. It works even in circumstances when the Service Diagnostics diskette cannot be loaded.

NEW: 386 diagnostics for hybrids and PS/2s!

For over nine years, major manufacturers have been relying on SuperSoft's diagnostics software to help them and their customers repair microcomputers. End users have been relying on SuperSoft's Diagnostics II for the most thorough hardware error isolation available. Now versions of Service Diagnostics are available to save everyone (including every serious repair technician) time, money, and headaches in fixing their computers, even non-IBM equipment.

All CPUs & Numeric Co-processors	All Color Graphics & Monochrome
System Expansion & Extended Memory	Monitors
Floppy, Fixed & Non-standard Disk Drives	Parallel & Serial Ports
Standard & Non-standard Printers	Mono, CGA, Hercules & EGA
System Board: DMA, Timers, Interrupt,	Adapters
Real-time Clock & CMOS config. RAM	All Keyboards & the 8042 Controller

Join the ranks of XEROX, NCR, CDC, SONY, PRIME, ... who have bundled SuperSoft's diagnostics with their microcomputers at no risk because of our 30 day money back guarantee.

Service Diagnostics for PC, PC/XT, and compatibles only.....	\$169
Alignment Diskette for PC, PC/XT and compatibles (48 tpi drives).....	\$ 50
Wrap-around Plug for PC, PC/XT and compatibles (parallel and serial).....	\$ 30
Service Diagnostics for AT and compatibles only.....	\$169
Alignment Diskette for AT and compatibles (96 tpi drives).....	\$ 50
Wrap-around Plug for AT (serial).....	\$ 15
ROM POST for PC, PC/XT and compatibles only.....	\$245
ROM POST for AT and compatibles only.....	\$245
Service Diagnostics: The KIT (includes all of the above—save \$502).....	\$495
Service Diagnostics for 386 or V2, V30, or Harris, etc. (please specify)...	\$195
Diagnostics II is the solution to the service problems of users of all	
CP/M-80, CP/M-86 and MS-DOS computers.....	\$125
ROM POST for PS/2 and compatibles only.....	\$245
Alignment Diskette for PS/2 and compatibles (3.5 inch).....	\$ 50

To order, call 800-678-3600 or 408-745-0234
FAX 408-745-0231, or write SuperSoft.

your microcomputer repair solution

SuperSoft

FIRST IN SOFTWARE TECHNOLOGY P.O. Box 611328, San Jose, CA 95161-1328 (408) 745-0234 Telex 270385

SUPERSOFT is a registered trademark of SuperSoft, Inc.; CDC of Control Data Corp.; IBM PC, AT & XT of International Business Machines Corp.; MS-DOS of Microsoft Corp.; NEC of NEC Information Systems, Inc.; PRIME of PRIME INC.; Sony of Sony Corp.

SHORT TAKES

difficult to install the ribbon in the print-head guide, and it tended to slip out.

The printer's noise level, tested with a Radio Shack 33-2050 sound meter, is about 72 decibels, which is about the same as that of the LQ-500 and

the NEC P2200.

The real strong point of the ALPS Allegro 24 is its paper-handling features. However, oversensitivity to paper thickness and the inadequate print quality are major drawbacks.

—Nick Baran

An Expert System for Family Health Care

As a new parent and an artificial-intelligence enthusiast, I was particularly interested in **FamilyCare Software**; it's advertised as an expert system that you can use to help diagnose children's medical problems. You use menus to select one of four areas (accidents, general, skin problems, and newborns) and a topic within that area (e.g., head injuries, fever, or crying). Then you engage in a dialogue with the program; it solicits the information it needs from you, in a question-and-answer format, and then dispenses some advice.

Since I've got a 3-month-old child, I picked the category newborns/crying. The program asked: "Does crying worsen when you pick up the baby and rock him/her?" I said no. (But if you answer yes, the program responds: "URGENT! Get medical help

now. Your child should see a physician within 60 minutes.") Then the program asked: "Does your baby seem to be in severe pain, or pain that lasts for more than 2 hours?" Again I said no. (But again, if you answer yes, the program shouts the same strident warning.)

Finally, the program asked: "Are you afraid that the crying might make you lose your temper?" Well, yes, aren't we all? Again the program shrieked "URGENT!"; to its standard admonition, it appended the ominous words, "Avoid a tragedy, seek help." That's a far cry from the calm and reasonable advice in *Dr. Spock's Baby and Child Care*.

Other areas of the program exhibit the same behavior. You don't need artificial intelligence to tell you to get help if a child is unconscious or not breathing; you just need a smidgen of common sense.

What knowledge the FamilyCare database does possess is hidden behind the question-and-answer interface; there's no provision for browsing, so you can't thumb through the information on the disk the way you can page through a book. To get at the program's expertise and data, you must engage in a question-and-answer/symptoms-and-advice session.

For the \$99 price of this package, with its half-mega-byte nonindexed database, you could buy *Dr. Spock's* well-indexed classic and a dozen other pediatric medical reference books.

—Jon Udell ■

THE FACTS

FamilyCare Software
\$99

Requirements:

IBM PC or compatible with 256K bytes of RAM and DOS 2.0, or Macintosh with 512K bytes of RAM.

Lundin Laboratories, Inc.
29451 Greenfield Rd.
Suite 216
Southfield, MI 48076
(313) 559-4560
Inquiry 1003.

PC EXPERTS AGREE:

Proteus® offers the fastest for the least, and supports them the most.

Proteus® sells the fastest personal computers you'll find. But as experts from BYTE, InfoWorld, Personal Computing, and others have discovered, our computers are more than just fast.

They're also an excellent value. You can't find better performing computers at lower prices.

And Proteus allows you to custom configure a system to your exact specifications.

Finally, Proteus provides you with 15 months of Free on-site service and support. And if you're not

satisfied with Proteus equipment within 30 days, you can return it for a full refund.

These are the reasons why the experts are so impressed with Proteus. And they're not alone. NASA, Xerox, GE, RCA, Dupont, GM, Revlon, General Dynamics, the U.S. Government, the U.N., MIT, Harvard, and Cornell have all become big Proteus users.

For the fastest, most economical, best supported computers available, follow the experts to Proteus.

"This IBM-compatible is so fast I have had trouble measuring its speed."

Business Computer Digest

"The Proteus is one of the fastest desktop computer systems we tested, a zero-wait-state hot rod."

InfoWorld Magazine

"Proteus is markedly faster than any other personal computer we've worked with, including Deskpro 386/20."

Personal Computing Magazine

"...the favorite system of our technicians because of its speed."

InfoWorld Magazine

PROTEUS-286GTX

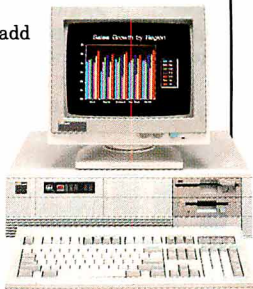
12MHz, ZERO WAIT STATE

- Intel 80286-12 CPU
- 640K RAM expandable to 16MB
- 32KB cache memory
- 8 expansion slots
- 2 serial & 1 parallel port
- 1.2MB floppy drive or 3.5" microfloppy
- Dual HD & floppy controller
- 200W power supply, 110/220V
- 101 key tactile keyboard
- 15-month free on-site service
- Made in U.S.A.

Complete Systems

with Hard Disk and Monitor:

- 20MB mono \$1,995
- 20MB VGA color \$2,395
- 20MB VGA plus \$2,780
- for 40MB add \$142
- for 80MB add \$445



PROTEUS 386/16

16 MHz opt. 20MHz

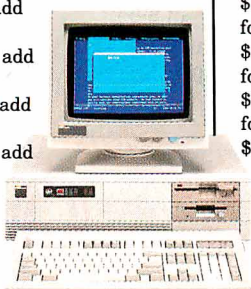
ZERO WAIT STATE

- Intel 80386 CPU at 16 MHz
- Optional 80386-20MHz
- 1MB RAM—Expandable to 16MB,
- Disk cache
- 8 expansion slots
- 2 serial & 1 parallel port
- 1.2MB floppy drive
- Dual HD & floppy controller
- 200W power supply, 110/220V
- 101 key tactile keyboard
- 15-month free on-site service
- Made in U.S.A.

Complete Systems

with Hard Disk and Monitor:

- 40MB 28ms mono \$2,899
- 40MB 28ms VGA color \$3,299
- 40MB 28ms VGA plus \$3,699
- for 80MB add \$185
- for 100MB add \$614
- for 150MB add \$1,420
- for 340MB add \$2,675



PROTEUS 386/25

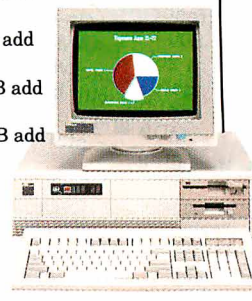
25MHz, ZERO WAIT STATE

- Intel 80386 CPU at 25MHz
- 1MB RAM expandable to 32MB
- 8 expansion slots
- 387 coprocessor support
- Cache memory
- 2 serial & 1 parallel port
- Dual HD & floppy controller
- 200W power supply, 110/220V
- 1.2MB floppy drive
- 101 key tactile keyboard
- 15-month free on-site service
- Made in U.S.A.

Complete Systems

with Hard Disk and Monitor:

- 40MB 28ms mono \$5,395
- 40MB 28ms VGA color \$5,814
- 40MB 28ms VGA plus \$6,195
- for 80MB add \$185
- for 90MB add \$1,129
- for 150MB add \$1,545
- for 340MB add \$2,675



PROTEUS POWER

EXTRA PROTEUS POWER WITH CUSTOMIZATION

- 1:1 interleave controller
- ESDI HD up to 700MB
- microfloppy drives
- tape streamers, 40MB to 225MB
- coprocessors
- brand name monitors and cards
- tower configuration on all models
- custom configuration on all models



To order, call us direct. 1-800-782-8387

For 24 hr catalog, call 1-201-288-8577 using your modem set at 1200B/N/8/1.

Technical Support Hotline: 1-800-541-8933 Reseller/VAR programs available.

All trademarks recognized. © Proteus is a registered trademark of Proteus Technology Corp. All prices, terms, specs subject to change.

Circle 226 on Reader Service Card

proteus
THE INTELLIGENT CONCLUSION

377 Route 17S, Airport 17 Center
Hasbrouck Heights, NJ 07604

DECEMBER 1988 • B Y T E 105

**A new way to look at color;
a better way to buy it.**



MM-1233 12" analog monochrome. Grey scale. MM-1433 14" analog monochrome. Grey scale. CM-1496 14" analog color. 31mm dot pitch. CM-1492 14" analog color. 39mm dot pitch. CM-1296 12" analog color. 28mm dot pitch.

Advantages are enhanced by Tatung

VGA provides significantly higher resolution. In fact, image clarity is 37% higher than EGA. And while EGA gives you 16 on-screen colors, VGA puts 256 colors (from a palette of 262,144 colors) on a monitor's screen at a time. Distortion, ghosting, and even eye fatigue is sharply reduced. In text modes, characters (even those with descenders like y, p and g) are more clearly defined thanks to a 9 x 16 dot matrix. But, while the monitor is a vital part of a VGA system, we think the real key is the VGA card that goes with it.

The Tatung VGA card is all performance

Ours is a 16-bit graphics array board with a single high speed, register compatible, VGA chip...a graphics controller that's incredibly fast (it has a bandwidth more than 7 times that of other VGA boards)! You can access this speed through the 16-bit data path to display memory, BIOS ROM, and I/O. Our exclusive SwiftWrite makes the wait state virtually non-existent. More? With 16 colors, resolution increases to 800 x 600. On-board is a 256K DRAM; and the card is backward compatible with EGA, CGA, MDA and Hercules graphics standards.

Tatung Monitors deliver the new standard

We offer the broadest line of VGA monitors available; 5 newly styled and engineered monitors. Each model provides 640 x 480, 640 x 350 lines of graphics resolution; 720 x 400 lines for text. Tatung's new VGA monitors offer a broad range of features that contribute to their superior value: dark, non-glare CRT's, automatic vertical sizing encoding, multi-color text or reverse video switch, 110/220V switch, chable power supply, removable tilt/swivel bases...all supported by Tatung's full year warranty.

Tatung bundles provide superior value

By bundling VGA monitors and cards, Tatung puts VGA within the reach of everyone. In most cases, the Tatung VGA bundle will cost no more than EGA packages! That's why we believe that feature for feature, dollar for dollar, the Tatung VGA bundle represents incomparable value. The kind of value only the largest manufacturer of monitors in the world can deliver.

In addition, Tatung offers users a huge advantage: a Tatung VGA bundle is 100% IBMTM VGA compatible and more...your investment in software is fully protected.

Tatung offers guaranteed compatibility

Whenever a new standard is introduced, system users have a justifiable concern about software compatibility. That's why Tatung offers a unique guarantee*: if you note any software incompatibilities within the 1 year warranty period, Tatung will correct them free of charge within 30 days, otherwise the full value of the Tatung VGA card will be refunded.

That's the Tatung VGA story. It's a story worth seeing. For complete information, specifications, and the name of the Tatung dealer near you, and to arrange for a demonstration, call us today. After all, seeing is believing.



TATUNG

We monitor the world.

In Southern California: (213) 979-7055

In Northern California: (408) 435-0140

Outside California: (800) 421-2929

Tatung Company of America, Inc.
2850 El Presidio Street, Long Beach, CA 90810

Tatung Science & Technology, Inc.

2060 Ringwood Ave., San Jose, CA 95131

Circle 331 on Reader Service Card

* Warranty applies to IBM PC, XT, AT Systems and their compatibles. Refer to Tatung VGA Card Manual for specific details. All details included with each Tatung VGA card. All names trademarked are properties of their respective manufactures.

At Long Last, Laptop

Compaq's 286 SLT laptop finally arrives, featuring a high-resolution display, battery-boosting technology, and a silver-plated price tag

It's been a long time coming, but Compaq—the company that made its name with IBM-compatible portable computers—has finally produced a computer for your lap. The Compaq 286 SLT is a real laptop that actually pushes the state of the art forward—though not necessarily in the ways you might expect. With a high-resolution display and an innovative approach to conserving power, Compaq's new laptop

is designed to harness all the power of a desktop PC in a computer that's genuinely portable.

What You Get

The Compaq 286 SLT is a battery-powered laptop that looks at first glance like a miniature version of Compaq's AC-powered portables; when it's packed for traveling it resembles a tool chest more than a briefcase. As you'd expect from its name, the processor is a CMOS version of the 80286, running at either 8 or 12 MHz. The standard complement of RAM is 640K bytes, expandable to 3.6 megabytes. There's a single 3½-inch floppy disk drive built in, along with a hard disk drive—20 megabytes on the Model 20, 40 megabytes on the Model 40. The price of the system starts at about \$5400 for the 20-megabyte system.

The first thing you notice when you turn on the Compaq laptop is that Compaq has decided not to compete head-to-head with Zenith with its display. The

“paper-white” LCD screen on the Zenith TurbosPort 386 makes it the envy of the industry; it would be hard to match the quality of that display. Compaq has taken a more standard approach, using a 10-inch LCD display with ordinary backlighting.

But while Zenith's paper-white display is a beautifully clear, easy-to-read CGA screen, the Compaq screen is a 640- by 480-pixel VGA display with eight levels of gray. It displays anything in VGA, EGA, or CGA mode (with 16 levels of gray in CGA). I had no difficulty using the Compaq's display; it has good contrast, and is easily readable from a wide range of viewing angles.

The detachable keyboard matches Compaq's standard layout. Compaq boasts that the keys are full-size with standard spacing; they were certainly easy enough to use, and felt normal for typing. There are LED indicators for Caps Lock, Num Lock, and Scroll Lock,

continued



and separate cursor-control keys. As on many laptops, there's also an embedded keypad: instead of a separate keypad, part of the regular keyboard doubles as the numeric pad. It didn't bother me, since I rarely use a numeric keypad, but it's an inconvenience at best for those who do. Fortunately, however, Compaq will be offering an external numeric keypad (\$129) that can be easily plugged into the system.

The good news about the keyboard is that while you can use it attached to the main unit, it also easily detaches. In fact, the SLT is one of the few laptops to have this feature. When it is attached, it sits on a shelf above the floppy disk drive and in front of the LCD screen. When detached, the keyboard is linked to the main unit with a coiled cable. The detachable keyboard makes this laptop very comfortable to use at a desk. For actual use in your lap, it balances better with the keyboard nested in its niche beneath the screen. Even at 14 pounds, this computer still sits comfortably on your lap.

Just below the keyboard in its niche is the rechargeable battery pack—it's spring-loaded, and easily pops in and out. The nickel-cadmium battery is specially manufactured for Compaq to stretch the time between charges. Compaq says the battery lasts about 3 hours between charges, assuming fairly heavy use of the hard disk. (One Compaq engineer told me that when he ran non-disk-intensive programs the system had lasted more than 5 hours.) The batteries charge automatically whenever the machine is

plugged in, and there's a fast-charge mode when the computer's not in use—they'll fully charge in 1½ to 3 hours.

Across the back of the machine runs the usual collection of connectors—parallel printer port, serial port, external monitor port, and external disk drive connector. The external 5¼-inch floppy disk drive (\$275) works, but the version I tested was big and noisy. It also didn't seem to be well integrated with the laptop—sitting next to the laptop on a desk, the external drive looked and felt like a gargantuan kludge. While I had no difficulty reading, writing, and formatting disks once it was properly installed, it took a while to get it working in conjunction with the internal floppy disk drive. Until I reran the configuration program, the computer would recognize either the internal or external floppy disk drive—but not both. Compaq offers a 40-megabyte tape backup unit (\$799) as well; it plugs into the external disk drive port.

There's also a connector for an external keyboard. It's possible to leave the Compaq laptop folded for traveling, attach an external keyboard and VGA monitor, turn it on, and use the computer without even opening it up. I tried various combinations of connecting an external monitor and keyboard, and they all worked as expected.

Finally, there's a connector for what Compaq calls a Desktop Expansion Base. The idea behind the expansion base is to make it easier for those who want to use their laptop as a desktop machine. Instead of constantly disconnect-

ing and reconnecting cables to the computer itself, the cables can be connected once to the expansion base; the computer slides into the base, and all the connections are made automatically. The expansion unit can also take up to two AT-compatible expansion cards, solving another common laptop problem. (The price of the Desktop Expansion Base will be \$999. How well all this will work is speculation; Compaq didn't even have a working prototype available when I saw the laptop.)

Expansion options inside the laptop's case are more limited but relatively painless: Remove six screws from the back and an internal chassis slides part way out, giving you easy access to most of the installable options. There are Compaq-standard memory-expansion slots for up to 3 megabytes of additional RAM (which is compatible with the Lotus/Intel/Microsoft Expanded Memory Specification 3.2). There's also a modem slot, designed for either an internal 2400-bps modem or an additional serial-port board. The one internal expansion option that's not easily accessible is the socket for an 8-MHz 80287 floating point coprocessor—it's well to the front of the machine, and requires more work to get at.

Power Trip

What makes the Compaq laptop unique is its approach to extending battery life. Like most laptops, the Compaq shuts down the display backlight when typing stops for a sufficient period of time, which saves a substantial amount of battery power.

But Compaq has taken that idea to new levels with this machine. Many parts of the system are powered down during periods of inactivity (you can even modify the power-monitoring system defaults). The hard disk, for example, which normally chews up lots of power, is powered down in a two-step process. Powering down the read circuitry adds an almost imperceptible delay in hard disk reads; powering down the motor adds a substantial delay when it's time for a hard disk access, but saves much more power. You can power-down parts of the modem if they're not being used. Only one bank of memory is at full power at all times. You can put the 12-MHz 80286 into standby mode, or run it at a slower speed (8 MHz), or bring it to a halt—all of which save power.

Once power really does run low, this laptop goes to extremes to protect you from losing your data. At about 10 per-

continued



Photo 1: At the office, the Compaq 286 SLT can be placed in its optional Desktop Expansion Base, which contains two standard expansion slots. At the left is another option, a 5¼-inch external floppy disk drive.

Introducing Exactly What You Had In Mind.

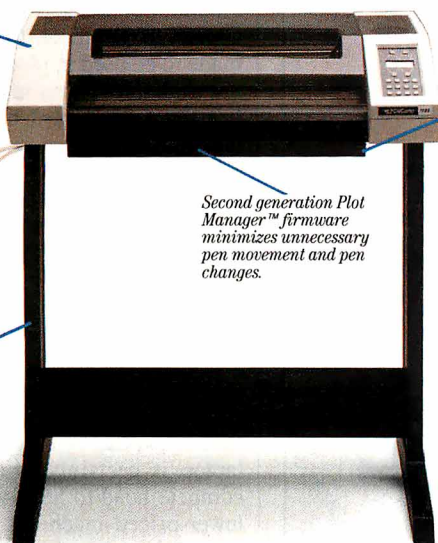
*D.C. servo drive motors
provide fast and accurate
pen positioning.*

*An optional memory
expansion cartridge
(1 or 2 megabytes) for
greater productivity
and convenience.*

\$4895

*Second generation Plot
Manager™ firmware
minimizes unnecessary
pen movement and pen
changes.*

*Die-cast aluminum side
supports add strength
and durability.*



But with none of the trade-offs you'll find in many other low-cost pen plotters.

Artisan's high performance meets the new sophistication and power of today's microcomputers, workstations and CADD software. It turns your ideas and designs into plots at speeds up to 30 inches-per-second, with resolution of .0005 inch, acceleration at 2g, and capability for eight pens in any combination of ink color and pen type.

All for less than \$4900.

The new CalComp Artisan. If you've got a mind for performance, quality and value, it's exactly what you've been looking for.

Call us at 1-800-CALCOMP. Or write CalComp, P.O. Box 3250, Anaheim, CA 92803. In Canada, call (416) 635-9010.

The New CalComp Artisan™ Pen Plotter Model 1023. Typical CalComp Quality And Performance At An Unusually Low Price.

Artisan is an easy-to-use, full-featured, high performance pen plotter that draws a full range of plots from A to D size on cut-sheet paper and film. All with the speed, accuracy, reliability and quality output you would expect from plotters costing twice as much.

**We draw on
your imagination.™**



A Lockheed Company

cent power—roughly 20 minutes before the batteries run dry—the machine beeps, and begins blinking a low-battery light. When the system runs critically low on power, it beeps twice, then begins to put the system into standby mode. The standby mode simply shuts down the system as much as possible without losing what's in memory: It turns off the display backlight and clears the display, halts the CPU, powers down the hard disk and modem, and stops all memory

access except refreshes. Once you've re-connected external power, you can return from standby mode—and you're right where you left off, with your data intact and your program still running. Compaq claims that, in standby mode, a few minutes worth of battery power can be stretched to hours.

You can also manually put the machine into standby mode with a button on the front of the computer. This is a convenient way to suspend work without

actually turning the computer off—one of the nicest features of early laptops such as the Radio Shack Model 100. I tested the standby mode with several different programs, and it suspended and resumed each of them perfectly.

How It Performed

In tests with a number of BYTE Lab benchmarks, the Compaq performed admirably, if not spectacularly. In its fast mode, the system ran the CPU tests on par with some of the better 12-MHz AT clones—about 50 percent faster than an 8-MHz AT. (For comparison, see "Out-classing the AT," July BYTE; the Compaq laptop was just slightly slower than the Arche Rival 286 in the CPU benchmarks, and in line with systems from Amdek, Dell, and Epson for hard disk tests.)

Pricey, But Worth Carrying Around

Compaq has plenty of experience building computers that can be carried around, but this new laptop is clearly designed to be more than portable—it's made to be used in places where power is not available. It has much better battery life than other hard disk-equipped AT laptops, and far more power than machines with a similar battery life, such as the Zenith Z-181. It's light enough (at 14 pounds) to be carried easily, and powerful enough that it's worth carrying around.

The Compaq laptop also offers things you won't find in most laptops—like VGA graphics and a button that lets you suspend and resume your work.

At \$5399 for the 20-megabyte model (\$5999 for the 40-megabyte model), this laptop is certainly pricey. And it will compete head to head with a number of lower-priced machines that are already firmly entrenched in the laptop market. These include Zenith, with its SuperPort 286, and Toshiba and NEC, which have both recently introduced similar 80286-based systems. But it's the first laptop to carry the Compaq label, which has almost become synonymous with quality.

We had expected that when Compaq finally introduced its laptop, it would be a significant machine, a system offering convenience approaching that of a Model 100 combined with the power and display capabilities of a desktop system. On the whole, Compaq has proved us right. ■

Frank Hayes is a BYTE associate news editor at the magazine's San Francisco office. He can be reached on BIX as "frankhayes."

MODEM

BELL 103/212A

CCITT V21/V22/V23/V22 bis

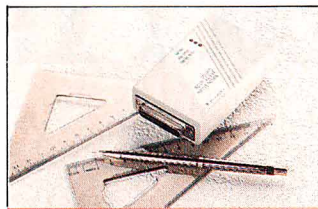
1200, 2400, 9600 BPS

AUTO-DIAL, AUTO-ANSWER

HAYES™ COMPATIBLE

MNP ERROR CORRECTION

FCC & PIT APPROVAL



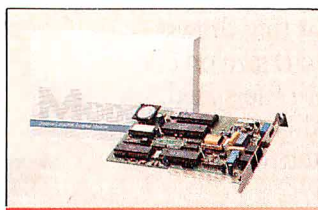
•Discovery 2400P Port Modem™
(Pocket-Size Portable Modem)



•Discovery 2400C Modem
Dial-Up/Leased-Line/Sync/Asyn



•Discovery 2100 Acoustic Coupler
(Pocket-Size Acoustic Cup Set)



•Discovery 2400HK Modem
Dial-Up/Leased-Line/Asyn



Datatronics Technology, Inc.

172 Nan-King E. Rd., Sec. 5, Taipei 10572, Taiwan,
Phone: (02) 762-3202 (3 Lines), (02) 768-6262 (3 Lines)
Telex: 28440 DTXMODEM Fax: 886-2-764-0614.

In U.S.A. please contact:
Sunhill Inc. TEL:(206)-575-4131

**RECEIVE A
FREE
SIVA 386
SYSTEM
(\$2995 VALUE)**

for the Holidays*

with the purchase of Quality
Hardware/Software Products.

See VNS America Corp. advertisements**
in this issue or call

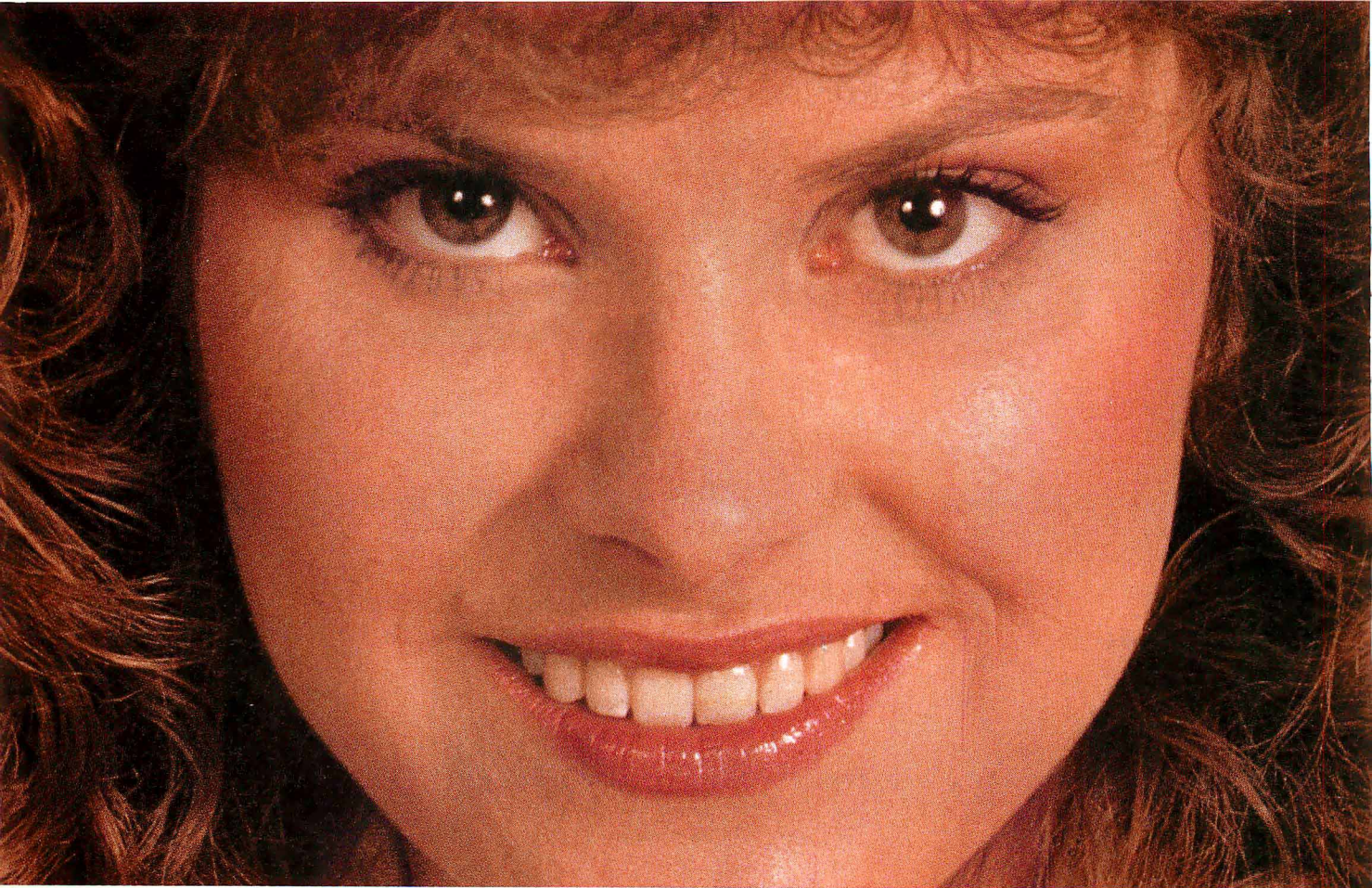
1-800-252-4212

VNS America Corp.

Suite 270, 910 Boston Post Road
Marlboro, Massachusetts 01752 U.S.A.
In Massachusetts 508-460-0016
FAX: 508-481-2218

*Offer good until December 31, 1988.

**See Advertisers Index for pages.



The Only Character Recognition System That Outperforms Ours.

Consider the facts:

Nature's character recognition system can be trained to read all characters and languages it sees. **SPOT** (Flagstaff Engineering's Optical Character Recognition program) is trainable too. It reads most printed documents in English and more than 130 other languages.

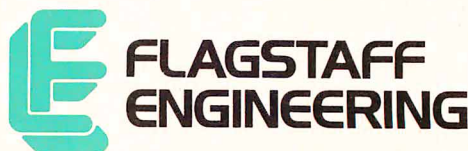
Like nature's original, **SPOT** is very discerning. It can glance over an entire page or zoom in on a few lines of text. **SPOT** can read newspapers, magazines, books, manuals, invoices, contracts, government documents and much, much more.

Your eyes are teamed up with that marvelous computer, the brain. **SPOT** uses the latest man-made personal computers in conjunction with the

most popular low-cost scanners, and requires no additional hardware.

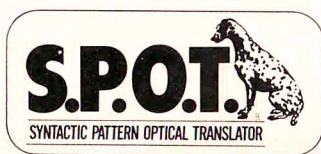
SPOT's advanced logic closely approximates what the human eyes and brain do. That's why **SPOT** will continue to be *the leader in OCR* ... with an intuition inspired by the original.

Seeing is believing. Since 1982, Flagstaff Engineering has helped thousands of international customers read information from various computer and printed media. Demonstration programs are available. Call today.



Helping People Read a World of Information

1120 Kaibab Lane • Flagstaff, AZ 86001
602-779-3341 • FAX 602-779-5998



Circle 105 on Reader Service Card
(DEALERS: 106)



Jerry deals with a temperamental VGA board and has an Amiga transplant

I think these machines are trying to drive me crazy. They're all in it together, you know.

It all started when we got back from 2 weeks in San Antonio (mostly for work) and New Orleans (for the World Science Fiction Convention). The trip was great. The problem was that when I got back, I was confronted with about 21 cubic feet of packages—software, hardware, and letters—all of it unopened, and I had to deal with the stuff.

Near the top was the latest version of Fractal Magic. I've mentioned the program before; it's a reasonable one for examining fractal images. I'd hoped Sinter Software would improve the documentation and user interface, but they haven't done much. (For example, you have to use the mouse to tell the program you want it to plot something; but then to get the menu of files it can plot, you must let go of the mouse and hit Return; after which, you must use the mouse again to choose one of the programs thereby displayed. Why they couldn't have let the mouse handle it all is beyond me. Oh, well.)

Anyway, it's a relatively painless way to look at recursive plots, things like the Mandelbrot set and the Ikenada equations (which have some similarities to the Mandelbrot set). This was a new version that could make use of VGA resolution (as well as CGA and EGA). Now all I had to do was put in a VGA board.

I also had the new VGA Paint program from RIX SoftWorks, which is said to be a doozy. Certainly, their EGA Paint is excellent. Before I left for New Orleans, RIX's Doc Livingston said he'd arrange

for a major outfit to send me a VGA board that showed up VGA Paint very well. When I looked in the huge stack of stuff, there it was. This, I thought, is going to be easy. I'll put in the new board and test a whole slew of VGA programs. I got out the automatic screwdriver—I'm getting very fond of those things—and opened up the Zenith Z-386.

Then I opened up the VGA board. It came with an invoice that said it was being lent to me for 30 days (which had started 2 weeks ago), after which I'd be billed for it; and if I sent the board back without calling them first to get a return authorization number, they wouldn't accept it. It also said that opening the package constituted acceptance of those terms. Of course, I couldn't read the terms before opening the package.

I can't possibly accept anything on a short-term loan like that, so the board went into the out stack. I don't have time to telephone them about it. If they really do refuse its return, I'm sure Notre Dame can use a VGA board.

Then I noticed that there already was a VGA board in the Z-386. It turns out that when we were experimenting with Unix, we discovered that SCO Unix with the Locus DOS-under-Unix package won't work with the Zenith Z-448 EGA video board, so Alex had installed our Video Seven Vega VGA board. That had worked just fine to drive the Zenith Flat Technology Monitor for Unix. (See last month's column. Incidentally, Zenith says they'll have new video boards worthy of their wonderful FTM Real Soon Now.)

I figured the Vega board was just what I needed. It's very fast. One thing I'll be working on with the Z-386 is Windows/386, and believe me, that needs a fast video board. Anyway, the Vega board was already installed, so all I needed to do was put the machine back together and install Fractal Magic.

That was simple enough. The only thing was that when I turned the machine

on, there was no color red on the screen. Plenty of greens and blues, in nice high resolution, but nary a flicker of red. I fussed about with it for a while. I was sure it wasn't the program, but just to be absolutely certain, I exited to DOS and invoked Norton Utilities to set the screen attributes to red on white.

Nothing happened. When we took Unix off the Z-386, we installed IBM DOS 4.0, and Norton Utilities don't work with DOS 4.0. (I now have a version that does.)

IBM DOS 4.0 has a bunch of reported bugs. So does the unofficial DOS 4.01; I've decided to wait for a real update, so that had to be removed. No time like the present. It didn't take long to go back to the Zenith clone DOS, which is something like version 3.21-R. Now I could invoke Norton's screen attribute command to tell it to display red on white.

I got black on white. No red.

OK, I thought. It's probably the board, but maybe it's the monitor. All I have to do is connect the FTM to the Cheetah's video output—the Award video card has both EGA and VGA outputs—and see if any red shows up. That monitor is heavy, and there wasn't any suitable table or other flat surface near the Cheetah, but I managed to get the FTM perched precariously on my desk—only to discover that I no longer have the Award EGA/VGA board in the Cheetah.

The Award board had worked fine with the Electrohome 19-inch variable-sync monitor until I tried Windows/386; but that had been too much for the Award board, so I'd put a good vanilla EGA board in the Cheetah. The EGA board outputs EGA on a 9-pin output jack. The 31-kHz analog FTM wants 15 pins.

That took care of that test. I could have put a new board in the Cheetah, but working on a tower-configuration machine isn't easy. You have to sit on the floor, and my knees were giving me fits anyway. Heck with it. Back to the Z-386.

continued

One thing the computer world desperately needs is some way to support the monitor on top of your computer and still be able to open up the computer. However, with the FTM perched on my desk, it was easy enough to get inside the Z-386, so I took out the Vega board. The Award EGA/VGA board was handy, so I put that in the Z-386, plugged the FTM into the 15-pin output, and turned things on.

Nothing. Snow. The Award board and

the FTM had worked together fine in the 20-MHz Cheetah, but they didn't work with the somewhat slower Z-386. It's likely I could have got out the Award manuals and figured out what was going on, but I figured enough was enough. Time to go get the Z-448 board. It's slow, and it won't work with either Windows/386 or VM/386, but it does work. I dropped that in and turned on the system, and everything was fine. Entering Norton Utilities' screen attribute command

SA WHITE ON RED gave me white letters on a red background.

I decided that the problem wasn't the monitor. Possibly settings on the Vega board? I got out the documentation, which is very well done. Among other things, it says that there are two classes of monitor, Variable Frequency Display and IBM Enhanced Color Display. There are two kinds of VFD monitors, giving three possible cases. Each case needs a different setting of the board's switches. Finally, there's this note: "If your monitor is not included in the above list, you may need to try different switch settings to see which works."

There was certainly nothing about the FTM in the list, so I changed the switch settings, put the Vega board back in, and fired up.

Voilà. Perfect. Plenty of red signal.

Now all I had to do was turn things off, put the case back on the computer, put the screws in, hoist the monitor onto the Z-386's case, turn it on. . . .

No red. None.

You don't have to open up the computer to change the switch settings on the Vega board. Turn off the computer. Change to a different setting. Turn it on. No red, and after a couple of minutes, I was convinced there never would be any red. Take out the board. Put in the Z-448 again. Plenty of red. Now, just for luck, try the Vega board.

Plenty of red.

Put the case back on. Works fine. No problem. I fired up Fractal Magic. As it happens, there is no red in the default color pattern—wouldn't you know it?—but you can change the colors, so I used that feature to put in plenty of red.

The picture is gorgeous. Curved lines look like curves. Diagonals look like diagonals. No question about it, VGA is nice. I let Fractal Magic run for the evening. It's got apparent motion, and with mixed colors, you have to see it to believe it. Eventually, I turned the system off for the night.

Next day I turned it on to show off the Fractal Magic to Mrs. Pournelle.

No red. The only way to get red was to open the machine and take the Vega board out. Put it back in. Still no red. Put in the Z-448. Plenty of red. Take it out and put in the Vega board. Plenty of red.

All right, I thought, it must be the Vega board. Video Seven had never heard of a problem like this, but they express-mailed another board.

Same situation. Fire up the computer with the Z-448, and there's red; leave the monitor on and install the Vega board,

continued

NEW: 1st-CLASS HT.™

EXPERT SYSTEMS WITHOUT PROGRAMMING. HYPERTEXT WITHOUT HYPE.

There's been a lot of talk lately about hypertext and expert systems. Now there's finally a product that does justice to both.

Introducing 1st-CLASS HT. The first expert system product to combine the power and accessibility of the 1st-CLASS line with the flexibility of hypertext search and retrieval.

The power you need. Without the programming. With 1st-CLASS HT, you can capture specialized expertise quickly and easily—without a major investment in hardware or software. The powerful 1st-CLASS approach requires no programming or artificial intelligence experience—yet offers rich rewards to those who have it. And the flexible HT functionality unlocks a whole new range of options for developers and end users alike.

A full featured, high performance package. With multiple knowledge representations, interfaces to other programs,

graphics, and a variety of data formats (including ASCII download, dBase, and Lotus 1-2-3®), 1st-CLASS HT has the best combinations of features you'll find in the expert system marketplace. Add the opportunity to browse through multiple levels of text—then immediately act on what you find—and we're sure you'll agree that 1st-CLASS HT is the first truly grown-up hypertext/expert system package.

You'll be joining over 7500 1st-CLASS users from startups to Fortune 500 companies like Chrysler, Du Pont, and IBM by using 1st-CLASS HT. So why settle for less?

Just \$20 gets you a tutorial package. It has everything you need to get moving fast. And just \$2495 gets you 1st-CLASS HT itself.

Why wait? Call now to order your tutorial package.
Toll-free: 1-800-872-8812.

1st-CLASS
Expert Systems, Inc.

One Longfellow Center, 526 Boston Post Road Wayland, MA 01778 800-358-8812 (508-358-7722 in MA).
1st-CLASS Expert Systems priced from \$495 to \$2495. For the IBM® PC. For the DEC VAX®.
© Copyright 1988, 1st-CLASS Expert Systems, Inc.

Compuclassics

WE WELCOME INTERNATIONAL ORDERS

1 818 705-4885 FAX

SOFTWARE

ALDUS	
Pagemaker 3.0	539.00
AMERICAN SMALL BUSINESS	
Design Cad	159.00
Design Cad 3D	159.00
ASHTON TATE	
Multimate II	279.00
Dbase III Plus	395.00
Rapidfile	195.00
Framework II	429.00
Chartmaster	229.00
Master Graphics	299.00
ASK SAM SYSTEM	
Ask Sam	235.00
AUTODESK	
Autosketch Enhanced	65.00
BLOC DEVELOPMENT	
Formtool W/Greatest Hits	59.00
BOEING COMPUTER SERVICES	
Boeing Graphics (3D Color)	209.00
BORLAND	
Spr't	125.00
Sidekick	55.00
Sidekick Plus	125.00
Eureka	99.00
Quattro	149.00
Turbo Database Toolbox	62.00
Turbo Graphix	62.00
The Developer's Library	235.00
Turbo Lighting	62.00
Reflex	90.00
Superkey	62.00
Turbo Prolog	62.00
Turbo Basic	62.00
Turbo C	62.00
Paradox V 2.0	429.00
Turbo Pascal 4.0	62.00
Turbo Tutor 4.0	45.00
BREAKTHROUGH	
Timeline V 3	339.00
BRODERBUND	
Print Shop	35.00
Memory Mate	45.00
BUTTONWARE	
PC File +	45.00
CENTRAL POINT	
Copy II PC	25.00
Copy II PC Option Brd Dlx	109.00
PC Tools Deluxe	39.00
COMPUTER ASSOCIATES	
Supercalc IV	299.00
Superproject Expert	445.00
ACCPAC BPI	275.00
Silverado	99.00
CONCENTRIC DATA SYSTEMS	
R & R Relational Report	109.00
CORE INTERNATIONAL	
Corefast	89.00
DAC	
Easy Accounting 3.0	59.00
Easy Payroll 3.0	59.00
Bonus Pack 3.0	115.00
UTILITIES	
Org Plus	59.00
1 Dir PLUS	55.00
Duet	49.00
Direct Access	55.00
Grammatik III	55.00
X Tree	37.00
X Tree Pro	69.00
Sideways	40.00
Max Think	45.00
Tornado	59.00
Graph-In-The-Box	55.00
Mace Utilities	55.00
Norton Utilities	50.00
Norton Utilities Advanced	79.00
Norton Commander	49.00
Disk Technician	59.00
Disk Technician Plus	79.00
Copywriter/Zerodisk	CALL
Desqview 2.01	75.00
Rightwriter	59.00
Mirror II	35.00
Flash 5.6	49.00
Q & A 3.0	199.00
Laplink Plus	85.00
Note-It-Plus	49.00
SOZ Plus	59.00
Cambridge Spreadsheet Analyst	89.00
The Documentor	179.00
dFlow	89.00

DATAFORM	
Procomm Plus	52.00
DBFAST	
Dbfast	62.00
DIGITAL RESEARCH	
Gem Desktop	32.00
Gem Draw Plus	179.00
Gem 1st Word Plus	115.00
Gem Word Chart	115.00
Presentation Team	285.00
Desktop Publisher	179.00
DIGITALK	
Smalltalk V	75.00
Smalltalk V 286	145.00
FIFTH GENERATION	
Fastback	79.00
Fastback Plus	99.00
FOX SOFTWARE	
Foxbase Plus	199.00
Foxbase Multi-user	299.00
Foxbase Runtime Unlimited	265.00
GENERIC SOFTWARE	
Generic Cad 3.0	55.00
Dot Plot	27.00
Auto Convert	27.00
Auto Dimension	27.00
3D Solid Modeling/Rendering	179.00
GDSON TECHNOLOGY	
Spinwrite	55.00
GOLDEN BOW	
V Feature Deluxe	125.00
V Cache	45.00
HAVENTREE	
Interactive Easyflow	129.00
HAYES	
Smartcom III	149.00
HILGRAEVE	
Hyper Access	89.00
IBM	
Displaywrite IV	299.00
DOS 3.3	95.00
LATTICE	
Lattice C Compiler	229.00
LEADING EDGE	
Word Processor W/Spell/Merge	59.00
Word Processor V1.5	89.00
LIVING VIDEOTEXT	
Grandview	159.00
LOTUS DEVELOPMENT	
ALL PRODUCTS	CALL
MATHSOFT	
Mathcad 2.0	225.00
MECA	
Managing Your Money 4.0	125.00
MERIDIAN TECHNOLOGY	
Carbon Copy Plus	115.00
MICROGRAFX	
Designer	465.00
MICROLYTICS	
Gofer	42.00
MICROPRO	
Wordstar Professional	249.00
Wordstar 2000 Plus	239.00
MICRORIM	
Rbase for Dos	475.00
MICROSOFT	
Pageview	35.00
Quick C	67.00
Word	225.00
Quickbasic	67.00
C Compiler	299.00
Fortran Compiler	299.00
Cobol Compiler	599.00
Macro Assembler	99.00
Learning DOS	35.00
Flight Simulator	35.00
Excel	309.00
Windows 386	129.00
PC Works	129.00
MICROSTUF	
Crosstalk XVI	99.00
Crosstalk Mark 4	125.00
MIGENT	
Ability Plus	145.00
NANTUCKET	
Clipper	439.00
NASHOBA	
Nutshell Plus	159.00
NORTH EDGE SOFTWARE	
Timeslips III	115.00
PAPERBACK SOFTWARE	
VP Info	65.00
VP Planner	55.00
VP Planner Plus	95.00

PATTON & PATTON	
Flowcharting II Plus	145.00
PC SUPPORT GROUP	
Lightning	55.00
Lucid 3D V 2.0	89.00
PEACHTREE	
Complete Accounting II	159.00
PERSOFT	
Smarterm 240	209.00
Referee	45.00
SANTA CRUZ OPERATION	
Xenix 286 Operating Sys	439.00
Xenix 286 Development Sys	439.00
Xenix 386 Operating Sys	509.00
Xenix 386 Development Sys	509.00
SCITOR	
Project Scheduler Network	365.00
SIMON & SCHUSTER	
New World Writer II	99.00
Typing Tutor IV	32.00
SOFTLOGIC SOLUTIONS	
Disk Optimizer	42.00
Cubit	42.00
Double DOS	42.00
@ Liberty	115.00
Magic Mirror	59.00
SOFTWARE PUBLISHING	
PFS First Publisher	79.00
Professional Write	119.00
Professional File	179.00
PFS Professional Plan	59.00
PFS First Choice	89.00
Harvard Total Project II	379.00
Harvard Graphics	299.00
STORAGE DIMENSIONS	
Speedstor	49.00
TRANSEC SYSTEMS	
Masterkey Unlock	109.00
dAnalyst	135.00
TURBO POWER	
TDebug	35.00
Turbo Professional	65.00
UNISON WORLD	
Printmaster Plus	32.00
Art Gallery I & II & III (Each)	19.00
Newsmaster II	49.00
WISEWARE	
Prime Time	65.00
WORD PERFECT CORPORATION	
Word Perfect 5.0	239.00
Word Perfect Network Server	349.00
Word Perfect Network Add-On	75.00
Plan Perfect	195.00
Data Perfect	299.00
Word Perfect Executive	125.00
Word Perfect Library	65.00
WORD TECH	
DBXL Diamond	115.00
Quicksilver Diamond	345.00
XEROX	
Ventura Publisher 1.1	519.00

FIFTH GENERATION	
Logical Connection 256K	379.00
HAYES	
Smartmodem 1200	299.00
Smartmodem 1200B W/Software	299.00
Smartmodem 2400	465.00
Smartmodem 2400B W/Software	465.00
HERCULES	
Hercules Monochrome Plus	189.00
HEWLETT PACKARD	
Laserjet II	1849.00
Fonts/Cartridges for Laserjet II	CALL
INTEL	
Above Board PC 64K	269.00
Above Board 286 W/512K	369.00
8087-3 (5MHz)	109.00
8087-2 (8 MHz)	159.00
80287 (6 MHz)	175.00
80827 (8 MHz)	250.00
80287 (10 MHz)	319.00
Inboard 386 PC or 386 AT	1099.00
1 MB Exp for 386 Inboard	675.00
INTERNATIONAL BATTERY	
AT Replacement Battery	19.50
AST Six Pack Battery	3.50
IRWIN MAGNETICS	
120 XT 20MB Internal	339.00
125 AT 20 MB Internal	339.00
KENSINGTON	
Masterpiece	89.00
Masterpiece Plus	105.00
Masterpiece Remote	115.00
LOGITECH	
Logimouse C7	75.00
Logimouse Hi Rez	99.00
Logimouse C7 + Paintbrush	95.00
Logimouse W/Cad/Paint	125.00
Publisher Mouse	125.00
MICROSOFT	
BUS Mouse W/Paintbrush	109.00
BUS Mouse W/Windows	145.00
Serial Mouse W/Paintbrush	109.00
Serial Mouse W/Windows	145.00
MICROSPPEED	
Fast Trap	95.00
MIGENT	
Pocket Modem	115.00
MOUSE SYSTEMS	
PC Mouse BUS Plus	95.00
PC Mouse Serial Plus	95.00
NEC HOME ELECTRONICS	
Multisync II	629.00
NEC INFORMATION SYSTEMS	
P 2200 80 COL	379.00
P5200	589.00
P5300	769.00
PANASONIC	
KX-P10911	209.00
KX-P1595	479.00
KX-P1524	649.00
KX-10921	365.00
PARADISE	
Autoswitch 480	169.00
VGA Plus	279.00
PLUS DEVELOPMENT	
Hardcard 20 MB	569.00
Hardcard 40 MB	709.00
POLAROID	
Polaroid Palette	1499.00
Polaroid Palette Plus	2399.00
PRACTICAL PERIPHERALS	
Practical Modem 1200 Internal	69.00
Practical Modem 1200 SA	109.00
Practical Modem 2400 INT	155.00
Practical Modem 2400 SA	185.00
SAMSUNG	
Amber Monitor	85.00
SEAGATE TECHNOLOGY	
ST 251 40MB No Controller	389.00
ST 225 20MB W/Controller	295.00
ST 238 30MB W/Controller	319.00
ST 251-1 No Controller	445.00
SUMMAGRAPHICS	
Summasketch 1201 Plus	389.00
SYSGEN	
Ext 5 1/4" Drive	289.00
TOUCHBASE	
Worldport 2400 Modem	269.00
Worldport 1200 Modem	159.00
TOSHIBA	
T 1000 Laptop	875.00
T 3100-20 Laptop	3415.00
P321 SL Printer	549.00
P341 SL	759.00
P351 SX	1175.00

ADVANTAGES

- Orders placed before 3 p.m. (PST) shipped same day
- We welcome corporate accounts
- Immediate replacement of defective goods.
- Bulk discounts

- Immediate shipment on purchase orders from qualified institutions (schools and universities included)
- No hidden charges.

TERMS:

All prices are subject to change without notice. We

do not guarantee compatibility. No surcharge for VISA or MasterCard. 2% surcharge American Express. No returns without RA#. Short shipments must be notified within 48 hours. 15% restocking fee on non-defective goods: \$3.50 C.O.D. charge. Shipping \$4.50 minimum per item, less on bulk orders. (\$8.50 Blue Label.) (Higher for some software or hardware items.)

Call for prices for any software item not included in this price list.

Order desk & technical support open 8 a.m. to 6 p.m. Monday-Friday 10 a.m. to 2 p.m. Saturday (PST)
P.O. BOX 1588
6934 Canby St., Suite #109-110
Reseda, CA 91335
Telex 292415COMPU/Fax 818-705-4885

WE WELCOME INTERNATIONAL ORDERS

1 818 705-1895 US

1 800 231-6603 CA

1 800 328-4473 US

and there's still red. Turn off the monitor, and when you turn it back on, there won't be any red until you get out the Z-448 board....

That seems an unduly complex start-up procedure, so I asked Zenith to swap monitors. I *know* that the FTM with the Vega board works, because Wayne Rash is using that setup and loves it. I have one of the very first FTMs Zenith ever made, and I suspect it has a flaky chip. I don't know anyone who *ever* had the kind of problem I have.

The new monitor came this morning. It works fine with the Vega board. I sent the old one back; maybe Zenith can figure this out. As for me, every now and then I find myself going "beedee, beedee, beedee...."

VGA Paint

Once I had the Vega board installed, I was able to play around with VGA Paint. As I'd expected, it's great. I'm no artist, but certainly VGA Paint lets you do all the things you expect in a paint program. A smooth function deliberately blurs sharp edges and lines. There's a zoom that lets you get right down to individual

pixels and play with them.

Some of the demonstrations are spectacular.

Just for the heck of it, I got out my Datacam computer screen camera and took a couple of shots. The Datacam can use ordinary film or a special Polaroid 35mm slide film. Both give nice results when you use them to shoot stuff done with VGA Paint. It all looks especially nice when it's done on the FTM. The Vega board and the FTM are a winning combination.

Standards change. The first IBM PC color board, CGA, was just too fuzzy; if you had to stare at screens of CGA text for long, you'd go blind. When EGA came out, it rapidly became the default business color standard because it is good enough; in fact, I'm writing this now using Q&A Write, a vanilla EGA board, and the Electrohome 19-inch color monitor to display white letters on a blue background. I don't mind it at all.

Programmers, however, *hate* EGA because the board and chip set were badly designed. You can't read the EGA registers, meaning that you can't tell what state the silly thing is in, meaning that

it's hard to write software that takes advantage of all its capabilities and yet doesn't get confused.

You can do fairly nice color work in EGA; RIX SoftWorks has an excellent paint program for it. However, EGA is nowhere near as nice as VGA.

I've heard stories that even VGA isn't really good enough to be a standard. Of course, the question is, "Good enough for what?" By me, VGA is plenty good enough, especially the fast Vega board driving an FTM.

My next step is to get Candy Cable to make me up a 15-pin-to-9-pin video cable so I can run my Electrohome 19-inch monitor off the Vega board. I expect it will be spectacular.

Amiga 68020

Longtime readers will know I've sometimes had problems with Amiga computers. Part of the difficulty is me: the Amiga is a powerful multitasking machine, with a fairly complex operating system. Unlike the Macintosh, which is easy to use but limited in what it can do—you can learn almost all you ever will

continued

FIVE GOOD REASONS TO BUY A MOUSE-TRAK.™



Count them. With MOUSE-TRAK, five fingers do all the work. Because it uses trackball technology, input and precision control is at your fingertips, not your elbow.

With CAD, Desktop Publishing or Spreadsheet applications, MOUSE-TRAK is easier, faster, more relaxed and a lot more comfortable to use than ordinary input devices.

MOUSE-TRAK OFFERS YOU OPTIONS

2 or 3 buttons — speed control — Multiple Interfacing

MOUSE-TRAK is stationary. Only the highly efficient trackball moves, eliminating tiresome arm and wrist movement. You can operate MOUSE-TRAK in your hand, even sit back with it on your knee. It plugs into your computer and needs no additional power supply.

User definable input keys are in easier-to-use locations. The uniquely patented shape has been developed through rigorous ergonomic studies of hand sizes and finger geometry. Made in the U.S., MOUSE-TRAK



is already in use by the military in planes, subs and tanks. Engineers at IBM™, Texas Instruments™ and Motorola™ are also using MOUSE-TRAKS.

MOUSE-TRAK carries a money back guarantee. If you don't like using MOUSE-TRAK within 30 days, we'll refund your money. And, if you do like it, we'll give you \$10 for your old mouse. MOUSE-TRAK ranges in price from \$139-\$189.

Call us toll-free for the complete story on MOUSE-TRAK and the name of a dealer near you. Our new brochure is available upon request.

1-800-533-4822
(in Texas 214-494-3073)

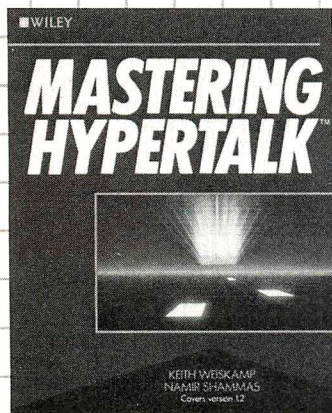
mouse-trak®

3121 Benton Street, Garland, Texas 75042 USA, Telefax 214-494-4159

IBM, Texas Instruments and Motorola are registered trademarks of their respective companies. MOUSE-TRAK is a registered trademark of ITAC Systems, Inc.

Circle 146 on Reader Service Card

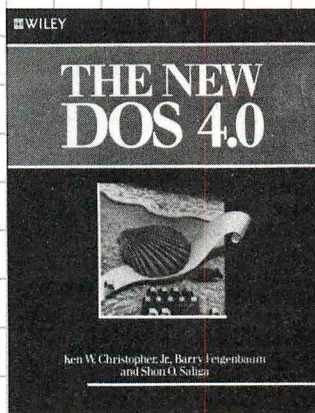
Always the Smart Choice.



Mastering HyperTalk™

Keith Weiskamp & Namir Shammas

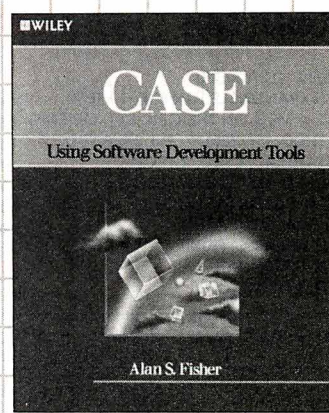
An intermediate to advanced-level guide complete with numerous script examples, special tips and warnings, illustrations, and diagrams designed to reinforce concepts and make learning quick and easy. (1-61593-5) \$24.95



The New DOS 4.0

Ken W. Christopher, Jr.,
Barry Feigenbaum & Shon O. Saliga

The design architects for IBM PC DOS Version 4.0 provide invaluable tips and techniques for getting the most out of this more powerful and versatile version. (1-50257-X) \$22.95



CASE

Using Software Development Tools

Alan S. Fisher

CASE Using the Newest Tools in Software Development

Alan S. Fisher

This essential new guide provides cutting edge information on every aspect of computer-aided software engineering. (1-63747-5) \$24.95

When you go to work with your computer, sit down with the best. Wiley Computer Books give you incisive, on-target instruction, top authors, and a complete selection that covers the latest software, hardware, and applications. Get smart — with Wiley.

The PC Upgrader's Manual

How to Build and Extend Your System

Gilbert Held
(1-63177-9) \$19.95

DOS Productivity Tips & Tricks

Gilbert Held
(1-60895-5) \$22.95

IBM™ PS/2 A Business Perspective Revised Edition

Jim Hoskins
Includes all new models
(1-62126-9) \$19.95



R:BASE™ for DOS A Business User's Guide

Susa Condliffe
(1-60064-4) \$21.95

Hard Disk Smarts

Chris A. Bosshardt
(1-63847-1) \$21.95

Hands-On HyperCard™ Designing Your Own Applications

Mimi Jones &
Dave Myers
Covers Version 1.2
(1-61513-7) \$22.95

Applying Turbo Pascal® Library Units

Namir Shammas
Compatible with Version 5.0
(1-60616-2) \$22.95

WILEY

Wiley works for your computer.

AT YOUR LOCAL BOOKSTORE OR CALL 800-526-5368

605 Third Avenue, New York, NY 10158-0012
In Canada: 22 Worcester Road, Rexdale, Ontario M9W 1L1

BEST BUYS ON THE MARKET!

80286-12 MHz ZERO WAIT STATE

20 COMPLETE MB EGA SYSTEM...

\$1595.

- 80286-12 (12/6) CPU
- 512K (EXPANDABLE TO 640K, 1 MEG 2 MEG, 4 MEG on the CPU-EXT. OR EMS)
- 20MB HDD (ST-225) • 1.2 MB FDD
- CONTROLLER (2 FDD, 2 HDD)
- EGA CARD w/AUTO SWITCH
- 14" EGA COLOR MONITOR w/TILT & SWIVEL BASE
- SERIAL, PARALLEL PORT
- CLOCK CALENDAR w/BATTERY BACKUP

- TURBO SPEED & RESET BUTTON
- 200W POWER SUPPLY
- 101 ENHANCED KEYBOARD
- 6-16 BIT, 2-8 BIT SLOTS
- 80287 MATH SOCKET
- OS/2 COMPATIBLE
- NORTON V3 SI - TESTED 15.3
- CHOICE OF CABINET
- ★ FULL (21"W x 16.5"L x 6"H)
- ★ COMPACT (14.5"W x 16"L x 7"H)

12 MHz ZWS SYS	20 MB ST-225 (65MS)	40 MB ST-251 (40MS)	40 MB ST-251-1 (28MS)	80 MB ST-4096 (28MS)
EGA SYS	\$1595.	\$1760.	\$1860.	\$2050.
VGA SYS w/MULTISCAN MONITOR	\$1860.	\$1995.	\$2095.	\$2285.

• 30 DAY MONEY BACK GUARANTEE. Your complete satisfaction is our top priority. Any Suntronics system may be returned within 30 days from the date of shipment for refund less shipping charge. Items returned must be as-new without modification or damage. All manuals and packaging must be included. Return shipping must be prepaid and insured bearing a RMA (Return Material Authorization) on the shipping label.



CALL FOR OTHER CONFIGURATIONS!

SUNTRONICS, INC.
Since 1976

VISA/MASTERCARD ACCEPTED

1-800-545-9777

1 YEAR WARRANTY - PARTS & LABOR
ALL ITEMS IN STOCK!

Prices subject to change without notice - COD requires cash.

MAIN OFFICE (213) 644-1140

12603 S. CRENSHAW BLVD.
HAWTHORNE, CA 90250 M-F 8:30-5:30

ORANGE COUNTY (714) 538-0929

108 W. KATELLA AVE.
ORANGE, CA 92667 M-F 10-6 SAT 10-5

TURBO-XT

MONO SYSTEM
w/20MB HDD

\$895.

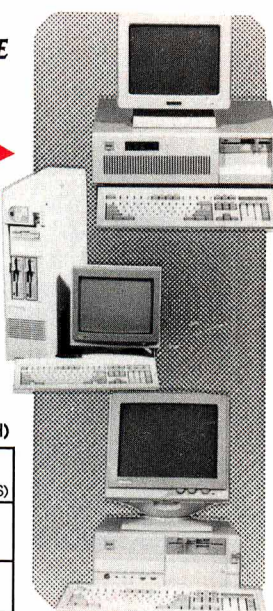
- 8088-2 8 MHz CPU w/640K RAM
- 20MB HDD w/CONTROLLER
- 360KB FLOPPY DISK DRIVE
- MONO G CARD (720 x 348 RES)
- 12" TTL AMBER MONITOR
- SERIAL, PARALLEL, CLOCK CALENDAR
- 101 ENHANCED KEYBOARD
- FRONT RESET SWITCH
- POWER, TURBO LED

80386

COMPUTER SYSTEM
w/40MB HDD

\$2785.

- 32 BIT 80386-16 (20 MHz OPTION)
- 1 MEG RAM (80NS)
- 40MB HDD • 1.2MB FDD
- 200W POWER SUPPLY w/DESKTOP CASE
- MONO G CARD w/14" TTL FLAT MONITOR
- SERIAL, PARALLEL, CLOCK CALENDAR
- 32KB (4-8 SRAMS) CACHE MEMORY
- 1-32 BIT (MEMORY), 5-16 BIT & 2-8 BIT SLOTS
- RELOCATABLE EGA & BIOS TO RAM



CHAOS MANOR

learn about using the Mac in a couple of days—the Amiga has lots of capabilities, and it deserves more time than I've been willing to give it.

On the other hand, the machine is sometimes beastly slow, especially at disk access.

Recently, some of that changed. Commodore sent Andy Finkel ("afinkel" on BIX) out to update my Amiga 2000 and see that I got properly checked out on using it. I also invited the local Amiga guru, Joanne Dow ("jdow"), to come over so she'd know what Andy did in case I needed help after he left.

The first thing Andy did was quite literally jack up my hard disk drive and run a new machine under it. While we were at it, we looked for a place to put a Supra hard disk drive, but there just isn't room for two of them inside the Amiga 2000's case.

The new Amiga has a 68020 processor. It also has new ROMs with the version 1.3 operating system. Prior versions of AmigaDOS required you to boot up the machine with a Kickstart floppy disk, even if you had a hard disk drive installed. No more. Now the Amiga boots

up from the hard disk, just like any other computer.

The next thing they did was save all the stuff from my hard disk and reformat it. There are new disk-access techniques that speed things up something wonderful. You no longer have time to grow a beard while the Amiga loads files.

Then they did a lot of tricks with the start-up sequence. I don't understand most of them. It's not that I *can't* understand, just that it will take time: the Amiga is a bit different from any other machine we have here. For example, to the Amiga, the command to get the disk directory is just another command file on the disk; before it can give you a directory, the machine has to go get the directory reading program and bring that into memory. Needless to say, that slows things a bit.

However, with the new AmigaDOS, it's possible to make that directory command a memory-resident program. DOS does this automatically—that is, a certain number of DOS utilities like DIR are brought into memory and left there on start-up. AmigaDOS 1.3 will let you do the same thing, except that, unlike PC-

DOS, AmigaDOS lets you choose which utilities you want in memory and which stay as disk files.

Interlacing

The normal video mode for an Amiga is 200 lines. Actually, the machine traces out 400 lines per frame, but lines 201-400 are identical to lines 1-200 and are put right on top of the previously painted set.

There's another mode, called interlace, in which lines 201-400 are different from lines 1-200. Line 201 goes in between line 1 and line 2; 202 between 2 and 3, and so on. The result is higher resolution. Alas, on the usual monitor, the image seems to jump up and down, and if you watch it long, you'll get a headache. You can make interlace mode usable for some programs by careful attention to colors and contrasts, but at its best it won't be all that easy to look at.

The problem is that for good CAD programs, you can use the higher resolution you get from interlace. One of the better programs, Intro CAD, doesn't even have a noninterlace mode. No matter what you

continued

What's Your Excuse?

Over the years, we've heard a lot of excuses.
We thought it was time to set the record straight.

The ten most used excuses for not buying
FLASH *The Disk Accelerator*.

1. It won't work for me because I've got extended memory!
2. My machine runs fast as it is!
3. Installing TSR's is too complicated!
4. Disk Cache?
5. I got one from IBM free!
6. Disk caches won't speed up floppies; that's all my portable has!
7. They're all the same!
8. I've heard disk caches will blow up my drive!
9. I've already got one, why spend more money?
10. All of the above.

FLASH is the hands down winner...
A feature rich caching program with
adjustable Cache sizes and support for
extended memory. Still the best caching
software for your money."

— Winn L. Rosch, PC Magazine
November 24 1987 —



The ten best reasons for buying FLASH *The Disk Accelerator*.

1. LIGHTNING won't work for you but FLASH will! FLASH not only accesses AT extended memory but uses AT extended, EMS expanded and conventional memories separately or in any combination of the three.
2. This is one of the biggest misconceptions! The fact is, the faster your processor the more you need a disk cache. Your 386 system won't be running at top speed until FLASH is installed!
3. We take pride in how hard we work to make your work easier. FLASH comes equipped with an organized, easy to use, easy to understand manual and command language. Not to mention, a sensible menu installation and command help screen!
4. We want everyone to be familiar with the fantastic benefits of increased system speed. We encourage you to call us or see your local dealer for information!
5. You get what you pay for!!
6. The popularity of portable systems has our competition scrambling to create a program that does cache floppies. FLASH, however, has been there all along. In fact, FLASH will buffer a whopping 26 device driven drives!
7. Please, don't be misled. FLASH, because of it's wide range of options and superior speed, is guaranteed to be the fastest and most versatile cache on the market. PC Magazine seems to agree!
8. Most can, but FLASH won't! Its unmatched level of compatibility helps generate the safest information transfer available!
9. Why? Because it's well worth the price! We want you to find that out. And, the price can't be beat. If you already own a disk cache we'll sell you FLASH for just \$19.95! Call for more details!
10. There aren't any reasons not to!

FLASH stands at the top of its class...
FLASH offers all the options of
LIGHTNING and more."

— Whitney Bolton, Byte Magazine
April 1987 —

"Better than several others... a clean
little program... impressive!"
— Howard W. Sams & Co. Publishing —

Editor's Choice

FLASH *The Disk Accelerator*.
from



SOFTWARE MASTERS

Smart Products for Smart People

\$69.95



Please call today 1-800-25 FLASH **CACHE OWNER \$19.95**
or see your local dealer.

Software Masters Inc.

6352 North Guilford Ave.

Indianapolis, IN 46220

(317) 253-8088

telemart

Doing Business Since 1980 A Division of CW Marketing, Inc.

SOFTWARE

DATA BASE MANAGEMENT

Clipper	\$405
dBase IV	Call
dBase IV LAN	Call
DB-XL Diamond	107
Eureka	Call
Genifer	188
Nutshell	123
Paradox 2.0	Call
PFS: Professional File	119
Q & A	185
Q & A Write	105
Rapid File	182
Revelation	463
R:Base For DOS	425
Reflex	Call
VP Expert	115
VP Info	56

PROJECT MANAGEMENT

Harvard Total Project Mgr. III	\$349
Microsoft Project 4.0	279
Timeline 2.0	259

WORD PROCESSORS

Easy Extra	\$53
Word (Microsoft)	179
Multimate Advantage II	259
PFS: Professional Write	102
Volkswriter 3	132
Volkswriter Deluxe Plus	63
Webster New World Writer	53
Webster Pro Spell Checker	32
Webster Thesaurus	37
Word Perfect 5.0	219
Word Perfect Executive	117
Word Perfect Library	58
Wordstar Pro Pack 4.0	Call
Wordstar 2000 Plus 3.0	Call

DESKTOP PUBLISHING

Newsmaster II	\$38
Pagemaker	489
PFS: First Publisher	65
Ventura Publishing	469

GRAPHICS

Engraphix	\$199
Freelance Plus	289
Generic CAD w/Dot Plot 3.0	72
Harvard Graphics 2.1	249
In-A-Vision	260
Microsoft Chart 3.0	223
News Room	30
News Room Professional	42
Printmaster Plus	28
PrintShop	32
Turbo Graphix Tool Box	58
VP Graphix	56
Windows Draw!!	165

MICE

PC Mouse II w/Paint (Buss or Serial)	\$82
PC Mouse II w/Autodesk (Buss or Serial)	99

Microsoft Buss Mouse 1.0	89
Microsoft Serial Mouse 1.0	89
MS Buss Mouse w/CADD	104
MS Serial Mouse w/CADD	104
MS Buss Mouse w/Windows	119
MS Serial Mouse w/Windows	119
Optimouse (PC Mouse) w/Dr. Halo III	78

INTEGRATIVE SOFTWARE

Ability Plus	\$137
Enable 2.0	352
Framework III	419
MS Works	76
PFS: 1st Choice	76
Smart Software System	395
Symphony	409

ACCOUNTING

ACCPAC Easy	\$53
Bedford Accounting	139
ACC PAC BPI	Call
DAC Easy Accounting	53
DAC Easy Payroll	53
In-House Accountant	103
One Write Plus 2.0	117
One Write A/R, A/P, Payroll	117
Time Slips III	108

UTILITIES

1 DIR Plus	\$46
Bookmark	56
Brooklyn Bridge	69
Carousel 2.0	43
Copy II PC	18
Copywrite	40
Corefast	85
Cruise Control	29
Disk Optimizer 4.0	37
Disk Technician	56
Double DOS 4.0	37
DS Back-Up Plus	45
Fastback	75
Fastback Plus	Call
Keywords	53
Laplink	69
Mace Utilities	47
Microsoft Windows 286	54
Norton Commander	43
Norton Editor	35
Norton Utilities 4.0	46
Note It Plus	45
PC Tools Deluxe	36
Printworks for Lasers	67
Referee	38
Sidekick Plus	125
Sideways	37
Smart Notes	43
SQZ Plus	53
Superkey	58
Unlock D Plus	52
Unlock Masterkey	99
XTree Professional	61

ACCESSORIES

Copy II Option Board Deluxe	\$99
Masterpiece	79
Masterpiece Plus	92
Masterpiece Remote	107
MousePad by Mousetrac	9
Summasketch 12 x 12 Plus	365

NOVELL

ANW/286 w/Key Card	\$1710
SFT NW 286 w/Key	2975
SFT/286 LVLI w/Key Card	1899
All Others	Call

LANGUAGES

Basic Compiler (Microsoft)	\$167
C Compiler (Microsoft)	254
Cobol Compiler (Microsoft)	508
Fortran Compiler (Microsoft) 4.1	254
Lattice C Compiler	209
Macro Assembler (Microsoft)	84
Pascal Compiler (Microsoft)	170
Quick Basic 4.0	56
Quick C	56
Ryan McFarlan Fortran	375
Ryan McFarlan Cobol	579
Turbo Basic	Call
Turbo C	Call
Turbo Pascal 4.0	Call
Turbo Prolog	Call
Turbo Prolog Toolbox	Call

TRAINING

Chuck Yeager Adv. Flight Simulator	\$25
Lets C	38
Mavis Beacon Typing	28
MS Learning DOS	29
MS Flight Simulator	29
PC Logo	79
Turbo Tutor 4.0	42
Typing Instructor Encore	25
Typing Tutor IV	27

SPREADSHEETS

Cambridge Analyst	\$80
4 Word	55
HAL	89
Lotus 1-2-3 Ver. 2.01	285
Lotus Manuscript	289
Lotus Report Writer	57
MS Excel	269
Multiplan 4.0 (Microsoft)	110
PFS Professional Plan	51
Quattro	140
Supercalc 4	278
Twin Classic	32
VP Planner	47
VP Planner Plus	112



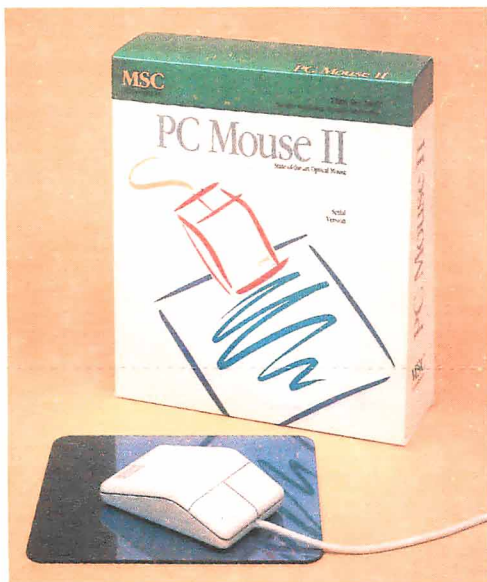
MEMBER
MMC
MICROCOMPUTER
MARKETING COUNCIL
of the
Direct Marketing Association Inc.

- No Charge for VISA and MasterCard.
- We Do Not Charge Your Card Until Your Order is Shipped.
- You Pay the Ground Shipping \$6.00 (except Alaska and Hawaii) We Pay the Air Difference.
- Free Air applies ONLY to orders up to 10 lbs. & Over \$100. 1-10 lbs. \$6.00; 11-20 lbs. \$10.
- Add 5% for C.O.D. Orders.

- All products carry only manufacturer's warranties. We do not honor guarantees, rebates, trial period privileges or promotional programs offered by manufacturers.
- No APO, FPO, or international orders, please.
- Call before submitting P.O.'s. Ask for National Accounts.
- Personal and Company Checks Will delay Shipping 3 weeks.
- Prices, Terms & Availability Subject to Change Without Notice.

Exclusive Offer!
Get Your Hands on A
\$15⁰⁰ Rebate

(See Back For Details)



PC Mouse II™ . . . 2000 cpi
The Next Generation

PC Mouse II advances the standard in precision pointing devices for PC's to a new level. This high-end optical mouse has a new ergonomically designed two-button case and comes from Ultra-Res 2000™, variable resolution software from 20 to 2000 cpi with nine different speed settings for fast and accurate operation. **PC Mouse II is 100% Microsoft compatible.** Get *The Next Generation* Mouse with either PC Paint Plus™ and Designer Pop-up™ Menu software, or bundled with Autosketch at a slightly higher price. PC Mouse II is available in either serial or bus versions.

MSC
Technologies, Inc.

the New Mouse Systems
47505 Seabridge Drive • Fremont, California 94538
(415) 656-1117

Exclusive Offer!
Get Your Hands on A
\$15⁰⁰ Rebate

(See Back For Details)

Exclusive Offer!

**\$15.00 Rebate When You Purchase Your
PC Mouse II™ from**

telemart

Send this rebate coupon along with a copy of your Telemart invoice to MSC Technologies, Inc. at the address below and claim your \$15.00 cash rebate.

MSC
Technologies, Inc.

the New Mouse Systems
47505 Seabridge Drive • Fremont, California 94538
(415) 656-1117

Name _____

Address _____

City _____ State _____ Zip _____

Offer Expires March 31, 1989

Exclusive Offer!

**\$15.00 Rebate When You Purchase Your
PC Mouse II™ from**

telemart

Send this rebate coupon along with a copy of your Telemart invoice to MSC Technologies, Inc. at the address below and claim your \$15.00 cash rebate.

MSC
Technologies, Inc.

the New Mouse Systems
47505 Seabridge Drive • Fremont, California 94538
(415) 656-1117

Name _____

Address _____

City _____ State _____ Zip _____

Offer Expires March 31, 1989

1-800-528-1054

HARDWARE

PRINTERS

Alps	
Allegro	\$345
ALQ224E	599
ALQ318	575
ALQ324E	749
2418	885
2424	955
Other Models	Call
AST	
Turbo Lazer	3639
Citizen Printers	
120D	149
180D	165
MSP 40	299
MSP 45	395
MSP 50	329
MSP 55	465
Premier 35	505
Tribute 124	Call
Diconix	
150	309
300	485
Epson Printers	Call
Hewlett-Packard	
Desk Jet	719
Lazer Jet Series II	1805
Paint Jet	1090
NEC	
P2200	350
P5200	515
P5300	679
Other Models	Call
Okiidata	
320	330
390	459
Lazerline 6	1325
Panasonic	
1080 I M2	165
1091 I M2	189
3131	305
3151	475
Lazer 4450	1635
Star Micronics	Call
Toshiba	
321 SL	489
341 SL	665
351 SX	939
Page Lazer	2415

DISK DRIVES

Bernoulli Box	
10 Meg	\$889
20 Meg	1245
40 Meg	1559
Beta Ext 20 Meg	1005
Beta Int 20 Meg	789
Seagate	
20 MG w/WD Controller	275
251-1 40 Meg AT	455
AT 40 MEG 251	375
Other Models	Call
Teac	
1.2 MEG AT	89
Floppy F55 BV	79
Toshiba	
3.5 Dr 720K	89
3.5 Dr 1.4MG	99

HARD CARDS

Plus 20 MG	\$519
Plus 40 MG	659

KEYBOARDS

Keytronics	
KB5151	\$119
KB5153	150
KB101 +	85

MONITORS

Amdek	
410	\$130
432	149
V210A	80
NEC	
Multisync II	\$595
Multisync Plus	899
Multisync XL	2065
Monographic System	1289
Other Models	Call
Princeton	
Ultrasync	515
Samsung	Call
Sony	
Multiscan (1303)	535
Mitsubishi	
Diamond Scan	499
Zenith	
1490	605

BOARDS

AST	
Hot Shot	\$345
Six Pack Plus	115
Xformer	579
Other Models	Call
ATI	
EGA Wonder	220
VIP	260
Hercules	
Color Card	145
Graphics Card Plus	170
Incolor	199
Intel	
Inboard 386 PC	760
Inboard 386 AT w/cable	1025
4020 Aboveboard	369
80287-6	155
80287-16	345
Orchid	
Designer VGA	299
Tiny Turbo	259
Twin Turbo	359
VGA	199
Paradise	
Autoswitch 350	155
VGA +	259
VGA Professional	380
Video-7	
Fastwrite VGA	355
VGA	265
Vega Deluxe	199
V-RAM	469

NOVELL

Altec Passive Hub	\$29
AQUILA 8 Port Active Hub	279
AQUILA Arcnet Card	99
SMC 110 Arcnet	129
All Others	Call

TERMINALS

Wyse	
30	\$285
50	369
85	439


FREE
AIR EXPRESS SHIPPING

 You Pay the Ground Shipping
We Pay The Air Difference

COMPUTERS

AST	
Model 80	\$1440
Model 140	2685
Model 340	3999
Model 390	5409
Other Models	Call
NEC	
Multispeed EL II	1479
Toshiba	
T-1000	785
T-1200F	1370
T-1200FB	1569
T-1200H	2285
T-1200HB	2415
T-3200	3785
T-5100	4895
Zenith	
Supersport/2	1655
Supersport 20 MG	2479
Supersport 286/Model 2	3445

MODEMS

Hayes	
1200	\$275
1200B	259
2400B	399
Prometheus	
1200B w/Software	70
2400B w/Software	125
Other Models	Call
US Robotics	
Password 1200	150
Courier 2400	289
Courier 2400E	335
HST 9600	635

- To Place an Order: 1-800-528-1054
- To Follow Up on an Order: (602) 944-1037
- Order Processing (602) 944-1037
- Order Line Hours: Monday-Friday 7:00 a.m.-6:00 p.m.
- Saturday 9:00 a.m.-1:00 p.m.
- We Do Not Guarantee Machine Compatibility

Mailing Address:

8804 N. 23rd Avenue • Phoenix, Arizona 85021

telemart
ORDER LINE

1-800-528-1054

do, trying to use the program with an ordinary monitor is nearly impossible; after a while, the flicker will drive you nuts.

However, if you're willing to spend the money, there's an elegant remedy. The Amiga has built-in video and stereo output, but there's also a video slot that can accommodate a third-party video board. Joanne Dow brought over the most popular one, a board called Flicker Fixer from MicroWay. Flicker Fixer out-

puts analog color at 31 kHz, and thus will play to most multiple-frequency monitors. In particular, it works with the NEC MultiSync monitor, and spectacularly well with the FTM. (We had no problem with red, even on my flaky old FTM.) The result is gorgeous.

Make Your Own Movies

One of the standard programs for the Amiga is Deluxe Paint II from Electronic Arts. At least one version of Deluxe Paint

has been around since the early days of the Amiga, and indeed, the program helped make the machine popular. Now there's Deluxe Productions, which lets you take pictures drawn with Deluxe Paint II (or, for that matter, pictures taken from any other source, including scanned-in pictures, provided only that they're stored in the Amiga standard image data format) and mix them. You can also mix in images from a VCR.

The results can be rather spectacular. Bring in, say, a map of the U.S.; overlay that with clouds and lightning; move the clouds across the map as the lightning flashes; bring in other weather fronts and move those; add titles and text boxes; and so forth. You can do an illustrated weather show that your local TV station would be proud of.

Deluxe Productions is quite easy to use, in the sense that it won't take an hour to learn how to do what I described above. It might take a lot longer than that to get it *right*, but that's a matter of artistic talent, not understanding the program. There is a learning curve, but much of what you must do is intuitive, and the rest is fairly simple to remember.

Deluxe Productions is capable of a kind of animation. It has a dozen ways to wipe images on and off. ("Wipe" is the term used to describe the way the image appears: does it start at the upper left corner and wipe itself on down to lower right? Or perhaps start in the middle and sort of spiral on?) You can bring in various objects, move them, and control how long they move and how long they pause. Wipe in a new background picture. Bring in more objects. Edit all the scenes that you've created. There are a bunch of other features, all described in a thick manual that for once has lots of examples and is easy to read.

I don't create ads, but if I did, I'd want a capability like this. It's sure great for just noodling around with images.

The manual says you need an Amiga with at least 1 megabyte of RAM. More memory helps; so does a hard disk drive. The manual also says you need Kickstart 1.2. We found that the program works fine with the 68020 machine running AmigaDOS 1.3.

Coming Attractions

The Deluxe Productions manual informs you that the program uses all the "chip RAM" it can get, and it warns you to close all extraneous windows before you use it. Chip RAM is peculiar to the Amiga: the special Amiga chip set has 512K bytes of very fast "video RAM"

continued

DEMONSTRATE SOFTWARE LIKE NEVER BEFORE!

VISUALIZE the excitement in a room full of potential buyers all viewing a demonstration of your new software simultaneously. Imagine answering their questions and showing them the software's amazing attributes and tantalizing graphics by manipulating the software in real time before their very eyes!

The era of the interactive presentation is here. MagnaByte instantly transforms anything that appears on your personal computer's monitor into a colorful electronic overhead projector, a personal computer, an audience and your innovative software. If you would like further information and the name of a dealer near you, write or call Telex Communications, Inc., 9600 Aldrich Avenue South, Minneapolis, MN 55420.

MagnaByte™

TELEX®

CALL TOLL FREE
1-800-828-6107

Wow!

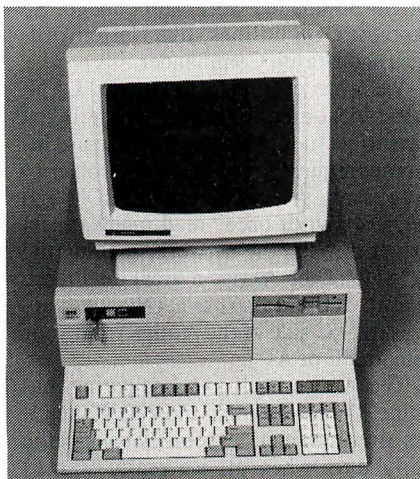
STOP

and Compare Our Quality and Prices Our Standards Are Their Options

IEEE 12 MHz 286

EGA Color System \$1850

- Samsung 14" EGA Color Monitor • 12 MHz PC-AT Computer • Baby AT Case with Key Lock, Turbo, Power and Hard Drive LEDs • Everex Enhanced Auto Switch EGA Card 640 x 480 • Intel 80286 CPU • Multi-speed 6/8/10/12 MHz • Keytronics 101 Enhanced Keyboard • 640k Memory Expandable to 1 Meg • 200 Watt Power Supply • Seagate Model ST251 42+ Meg Hard Disk Drive • 5¼" 1.2 Meg Floppy Drive • Western Digital 2 Hard Disk and 2 Floppy Controller with Cables • Serial / Parallel & Game Port • Complete Operations Manual • 80287 Math Co-Processor Slot • One Year Warranty



**286 16 MHz 0 Wait State
Running at 21.0 MHz**

With EGA Multisync (Analog) **\$1950**

With Monochrome + 40 Meg (ST-251) **\$1450**

With Monochrome + 20 Meg (ST-225) **\$1350**

IEEE 20 MHz 386 EGA Color System

\$2995

- Samsung 14" EGA Color Monitor • 20 MHz 0 Wait State Computer • Everex Enhanced Auto Switch EGA Card 640 x 480 • AT Case with Key Lock, Turbo, Power and Hard Drive LEDs (Tower Case available, see below) • Intel 386-20 CPU (not a 386-16) • Keytronics 101 Enhanced Keyboard • 1 Meg Memory • 220 Watt Power Supply • Seagate Model ST251 42+ Meg Hard Disk Drive • 5¼" 1.2 Meg Floppy Drive • Western Digital 2 Hard Disk and 2 Floppy Controller with Cables • Serial / Parallel & Game Ports • Math Co-Processor Slot • Complete Operations Manual • One Year Warranty

386-20 MHz EGA Tower Case 40 Meg (ST-251) **\$3195**

386-20 MHz EGA Multisync (Analog) 40 Meg (ST-251) **\$3295**

386-20 MHz EGA Tower Case 80 Meg (ST-4096 28 ms) **\$3495**

386-20 MHz EGA Multisync Tower Case (Analog) 80 Meg (ST-4096 28 ms) **\$3595**

All Systems Also Available with VGA

IEEE 16 MHz 286

EGA Color System \$2250

- Running at 21 MHz • 0 Wait State
- Samsung 14" EGA Color Monitor
- 16 MHz PC-AT Computer • Baby AT Case with Key Lock, Turbo, Power and Hard Drive LEDs • Everex Enhanced Auto Switch EGA Card 640 x 480
- Intel 80286 CPU • Multi-speed 8/16 MHz • Landmark Test of 21 MHz
- Keytronics 101 Enhanced Keyboard
- 1 Meg Memory Expandable to 8 Meg on the Motherboard • 200 Watt Power Supply • Seagate Model ST251 42+ Meg Hard Disk Drive • 5¼" 1.2 Meg Floppy Drive • Western Digital 2 Hard Disk and 2 Floppy Controller with Cables
- Serial / Parallel & Game Port • Complete Operations Manual • 80287 Math Co-Processor Slot • One Year Warranty

With EGA Multisync (Analog) **\$2350**

With Monochrome + 40 Meg (ST-251) **\$1850**

With Monochrome + 20 Meg (ST-225) **\$1750**



**DOS 3.3 — \$79
DOS 4.0 — \$109**

To Order, Call:

1-214-931-3777

ieee, inc. 17120 Dallas Parkway • Suite 212 • Dallas, Texas 75248

TERMS: One Year Warranty (12 months parts / 12 months labor). 30 day money-back guarantee (excluding shipping charge). We accept Visa, MasterCard, Discover (add 3% for credit cards), cashier's check, money order, wire transfer and personal checks (personal checks, please allow 10 working days to clear). Shipping and insurance extra. Prices and availability subject to change without notice. IEEE reserves the right to substitute equivalent or better products. No COD's accepted. 15% restocking fee on unauthorized returns. IBM XT/AT are trademarks of IBM Corporation. HOURS: (Central Time) 9 a.m. to 7 p.m. Monday through Friday, 9 a.m. to 5 p.m. Saturday.

MEMBER DALLAS CHAMBER OF COMMERCE

built into the system. (There is also "fast RAM," which corresponds to "motherboard RAM" on an IBM PC.) Chip RAM controls the Amiga's screen images. Programs can get into trouble if you have left a lot of screen windows open and the program needs more chip RAM than is available.

By the time you read this, Commodore will have upgraded the Amiga: there will be an optional new chip that contains a full megabyte of chip RAM, enough that no program should have any problems.

The PC Side

The Amiga 2000 was designed to compete with the IBM PC. The notion was that the PC is boring; the average banker or businessperson would really prefer an exciting computer like the Amiga but unfortunately has no choice because the work must be done. Enter the Amiga 2000, which has an IBM PC built into it.

This was no bad marketing notion, but it wasn't carried out very well. For one thing, there's no real attempt to marry the Amiga capability to the PC side. As far as graphics are concerned, the Amiga side of the system might as well not exist.

Another problem is that the PC side is absolutely and completely vanilla—a slow, cumbersome, and rather boring machine; the rest of the world has moved on to PC AT technology. Worse, most available speedup boards that convert a vanilla PC into an AT don't work on the Amiga 2000, which isn't quite 100 percent PCCompatible.

It's pretty close to 100 percent, however. The standard test programs, like Flight Simulator, work well enough. So do most DOS utilities, like Norton Utilities and Norton Commander.

We were even able to get the LANtastic local-area network running. (You have to set the LANtastic board to use interrupt request 5, but that's no problem.) As a result, you can access CD-ROM and WORM (write once, read many times) drives through the network, making the PC side of the Amiga a great deal more useful. You can also use LANtastic to access the PC side of the Amiga from your remote PC or AT.

The Amiga itself is a fascinating machine, the sort of thing most BYTE readers always wanted, especially back in the early days when all we really wanted

from our machines was a bit of fun. It's the greatest games machine in existence. (Wait until you see Rocket Man. Also, about the time you read this, Dungeon Master will be available for the Amiga.)

The Amiga also has enormous potential for education. It's cheaper than a Mac II, and powerful enough for nearly anything you'd want in a classroom.

Unfortunately, there isn't much business software for the Amiga side of the 2000, and while the Amiga in the hands of an expert can do things few PCs will ever do, it takes, if not an expert, at least someone very dedicated to learning the machine to get serious work out of it. There are still bugs, and AmigaDOS, while powerful, has some odd quirks.

Commodore is making progress. The 68020 Amiga with AmigaDOS 1.3 is a giant step in the right direction.

Scanning, Faxing, and Printing

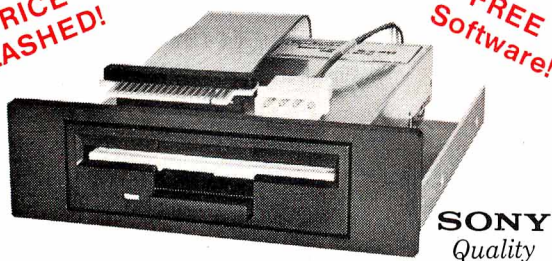
The Amiga doesn't have much business software, but the Mac II certainly does. It's got other stuff, too.

We recently got an upgrade for the LaserWriter. Plugging it in is no prob-

continued

PRICE
SLASHED!

FREE
Software!



THE 3.5" CONNECTION!

The perfect solution for upgrading your existing PC/XT/AT to "State Of The Art" 3.5" floppy disk technology! The Model 853W (720K) and Model 873W (1.44MB/720K) 3.5" drives are "drop-in" replacements for 5.25" drives! Disk format is fully compatible with popular Laptops (IBM, Toshiba, Zenith, etc.) and the new IBM PS/2 models. Both units come completely assembled and contain everything that you need, including Premium SONY drive, interface adapters, software device drivers and complete documentation. These drives utilize your existing controller so no additional slots are required (1.44MB requires AT class controller or special PC/XT High-Density Controller available from Tigertronics). Available with gray or black bezel (specify).

Model 853W
(720K)
~~\$159.95~~
\$129.95



Model 873W
(1.44MB)
~~\$229.95~~
\$159.95

400 Daily Lane • P.O. Box 5210
Grants Pass, Oregon 97527



IMMEDIATE DELIVERY!
Call 503 474-6700 or 503 474-6701
FAX 503 474-6703



A MESSAGE TO OUR SUBSCRIBERS

FROM TIME TO TIME WE MAKE THE BYTE subscriber list available to other companies who wish to send our subscribers material about their products. We take great care to screen these companies, choosing only those who are reputable, and whose products, services, or information we feel would be of interest to you. Direct mail is an efficient medium for presenting the latest personal computer goods and services to our subscribers.

Many BYTE subscribers appreciate this controlled use of our mailing list, and look forward to finding information of interest to them in the mail. Used are our subscribers' names and addresses only (no other information we may have is ever given).

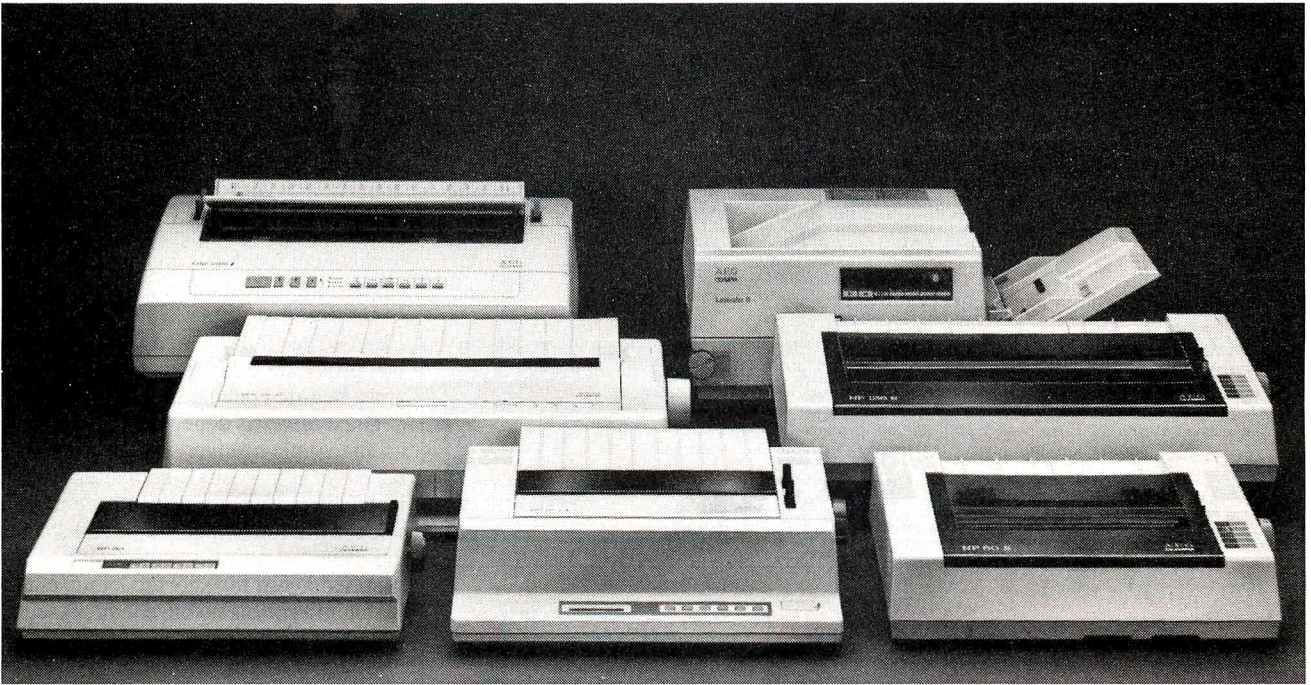
While we believe the distribution of this information is of benefit to our subscribers, we firmly respect the wishes of any subscriber who does not want to receive such promotional literature. Should you wish to restrict the use of your name, simply send your request to the following address.

BYTE MAGAZINE

ATTN: SUBSCRIBER SERVICE
P.O. Box 7643
TEANECK, NJ 07666-9866



Pick your printer problem and we'll show you a solution.



Check off your biggest frustrations with your printer, and we'll tell you about a state-of-the-art remedy from AEG Olympia.

☐ **Poor quality print:**

Never send out a shoddy or unreadable document again. Let us show you what first class printing looks like on everything from a daisywheel to our Laserstar 6.

☐ **Too slow:**

How does 240 cps on a 24-pin dot matrix sound to you? Or a laser printer that goes almost twice as fast?

☐ **Hard to operate:**

We have 8 different models with simplified front-panel controls. Easy to learn. Easy to run.

☐ **Clumsy paper handling:**

Too hard to switch between fanfold and single-sheet feed? How about a machine with Paper Parking that you don't have to switch at all?

☐ **Limited compatibility:**

Our printers can make just about any PC look good, from IBM's to Apples, and they'll run on all popular software programs.

☐ **Too noisy:**

Shut your eyes, and you can't tell whether our Laserstar 6 is on or not.

☐ **Not enough fonts:**

We have 24-pin dot matrix models with 4 resident fonts, our Laserstar 6 has 9, and for each you can get additional plug-in font cards.

☐ **Too expensive:**

If you want price/value, look at our best selling dot matrix model NP 30.

☐ **No support:**

Part of our "product" is our nationwide dealer network. If you have questions about any AEG Olympia printer, the answers are only a phone call away.

Tear out this page

and mail it with your name and address to AEG Olympia, Dept. ADV, Box 22, Somerville, NJ 08876-0022. Or if you're in a hurry, call us at 1-800-999-6872. It's the first step to making your problems go away.

Name _____ Title _____

Telephone _____

Company _____

Address _____

City _____ State _____ Zip _____

985

AEG
OLYMPIA

THE PROGRAMMER'S SHOP

helps save time, money, and cut frustrations. Compare, evaluate, and find products.

FREE Magazine!

And newsletter by respected industry opinion leader Bruce Lynch! Keep up with industry trends and events. Learn about intriguing new products and technologies. Get the informed opinion of development experts on programming strategy. 1 year (6 issues) of Programmer's Update PLUS periodic issues of The Programmer's Letter for only \$50! Call for your FREE sample issue of each! Mention BYC88.

New Discovery D the data language

by Caltex Software, Inc. 4GL relational data management system. 3-step data manipulation (isolate, arrange, report). Extensive file import/export. Unlimited number of data files per database. Example database online. \$395

Assemblers

	List	Ours
MS Macro Asm	150	105
Turbo Assembler/Debugger	150	105
Visible Computer 80286	100	89

C Language - Compilers

AZTEC C86 - Commercial	499	Call
High C-286 - by MetaWare	595	Call
Lattice C - V3.3	450	289
Microsoft C 5.1 - w/CodeView	450	299
Microsoft QuickC	99	69
Turbo C - by Borland	150	105
Watcom C6.5 - highly optimized	295	269

Dbase & Tools

CLEAR for dBASE	100	89
Clipper Summer '87	695	449
dBASE IV	795	529
dBRIEF w/BRIEF	275	Call
dBug - source debugger	195	179
Documentor	295	239
DBLX Interpreter	199	149
FoxBASE+ - V2.1	395	259
FoxTool Box	295	279
Genifer - code generator	395	259
R&R Relational Report	149	139
R&R Clipper & FoxBASE	55	45
Quicksilver Diamond	599	369
UI Programmer	295	249

Debuggers

	List	Ours
Periscope II - breakout switch	175	139
Periscope III - 10 MHz version	1395	1129

Editors

BRIEF	195	Call
Edix	195	159
Epsilon - like EMACS	195	159
KEDIT - like XEDIT, V.4	150	129
Personal Rexx	125	109
ME Macro Editor - Source	189	159
MKS VI	149	129
PC/EDT - macros	295	269
SPF/PC - V2.0	245	189
Vedit Plus	185	139

Text Screen

C Worthy w/forms	295	Call
with source	295	Call
Curses - by Aspen Scientif	119	109
Greenleaf DataWindows	295	219
PowerScreens - by Blaise	129	99
Vitamin C - source, menus	225	169
Windows for Data	295	265

Note: Mention this ad. Some prices are specials. Ask about COD and P.O.s. Formats 3" laptop now available, plus 200 others. UPS surface shipping add \$3/per normal item. All prices subject to change without notice.

Established 1983. We carry over 1,100 different products. Call today for complete technical information and advice, our catalog, literature, and solid value.

5-B Pond Park Road
Hingham, MA 02043
Mass: 800-442-8070
or 617-740-2510 10/88
Telex: 671-5348
FAX: 749-2018

800-421-8006

HOURS:
M-F 8:30 - 8:00
Sat: 10:00 - 4:00

UTAH

COBOL™

NEW

VERSION 5.0

\$69.95



For IBM® PC's, XT's, AT's and other DOS machines. Needs only 1 disk drive and 128K memory. This is the one you've heard so much about - with fast compile times, small object code modules, not copy protected, no royalties, and clear error messages. Version 5.0 is based upon ANSI-74 standards with new dynamite features including:

- Nested IF's and nested conditions.
- Indexed files (ISAM) with up to 24 keys (includes START verb). This advanced feature requires the software package Btrieve® which is optionally available.
- ACCEPT (line, column) numerics with decimal point alignment, numeric

checking, AUTO-SKIP, SECURITY, LENGTH-CHECK, EMPTY-CHECK, ATTRIBUTE (color), FROM ESCAPE KEY, DAY, DATE, TIME, DAY-OF-WEEK.

- Fast memory mapped DISPLAY's (line, column) ERASE, BEEP, ATTRIBUTE (color). Can display entire screen with one DISPLAY statement.
- Windowing, pop-ups, color and overlays. This advanced feature requires the software package Saywhat?™ which is optionally available.
- An easy to use, COBOL source code EDITOR with auto line numbering, A-margin, B-margin tabing with full screen cursor control.

Also available: Utah SuperSort®, a fast sort program callable from Utah COBOL; Utah FORTRAN; Utah BASIC; Utah PASCAL; Utah PILOT. Used by 50,000 professionals, students and teachers in 40 countries. 30-day money back guarantee. Discover the ease and simplicity of COBOL, today!



Since 1977

Ellis Computing, Inc.

5655 Riggins Court, Suite 10
Reno, Nevada 89502

Phone order rushed
by UPS 2nd Day Air:
(702) 827-3030

IBM is a registered trademark of International Business Machines, Inc. Btrieve is a registered trademark of Novell, Inc. Saywhat?! is a trademark of The Research Group. SuperSort is a registered trademark of Micropro International Corporation. Utah COBOL is a trademark of Ellis Computing, Inc. © 1987 Ellis Computing, Inc.

lem, or at least it isn't for ordinary establishments. My LaserWriter sits on a low shelf below the Hewlett-Packard LaserJet in the printer corner of the office; getting at that sucker in order to change boards isn't easy. It's especially hard just now, since every rolling test stand and table seems to be covered with machinery. They're all in this together, I tell you.

Anyway, eventually we cleared off a test stand so we could work on the LaserWriter. After that, upgrading it to NTX II status was a snap: loosen two screws, pull out the old smarts board, and insert the new one. Whole operation took about a minute. Of course, it took another 10 minutes to get the upgraded LaserWriter back where it belongs and connect all the cables, but that's not the machine's fault. (Actually, it is Apple's fault: not that the LaserWriter is large and heavy, but that the silly little cables are small, delicate, and a bear to connect properly.)

Once that was done, we could connect up the Apple scanner. That turns out to be easy: it's a small-computer-system-interface device, so all you have to do is select a unique number for it and connect the cable. Naturally, the cable Apple supplied is just too short to let me put the scanner in the most convenient place, but why did I expect anything else?

Using the scanner seems to be easy enough. There are a lot of fine points I haven't picked up, but in general the Macintosh philosophy has been followed: the way to do something is generally obvious, and if you noodle around with menus to see what various options do, you'll learn quickly enough. There's also quite a nice tutorial.

Once an image has been scanned in, you can diddle with it a bit, then save it. The software recognizes two save formats—a PICT format, which can print to PostScript printers, and a MacPaint format. The MacPaint image can't be bigger than 8 by 10 inches. The AppleScan software can read only PICT files.

When you have your image in memory—it will be a big file, and you'll much appreciate having Priam's 330-megabyte MacDisk if you're going to save many images—you can print it on the LaserWriter II, or send it by facsimile if you have an AppleFax board. You can also accept an incoming fax to be printed on the LaserWriter or stored on disk. We've got AppleFax, but what with all the other activity around here, it never got installed. Next week for sure. I have no doubt it works.

Apple equipment isn't cheap, espe-

continued

Order Status,
Technical & Other
Info. (602) 246-2222
FAX #(602) 246-7805
Call for programs not listed

WAREHOUSE DATA

PRODUCTS

**MICROSOFT PC Excel
SPECIAL \$250**

Call on all Microsoft Mouses

TOLL-FREE ORDER LINE 1-800-421-3135



Holiday SPECIALS

Complete Epson Equity I Plus w/Printer ... \$1249
Complete Epson Equity II Plus w/Printer ... 2369
Complete AT&T 6386 WGS w/Printer ... 2795

— SOFTWARE —

Accounting

Dac Easy Acct. 3.0 **Low Price**
Dac Easy Light \$39
Dac Easy Payroll **Low Price**
Dollars & Sense 94
In House Acct. 112
Managing Your Money 4.0 117

Communication Programs

Brooklyn Bridge Universal \$75
Carbon Copy Plus 108
Crosstalk XVI 92
Crosstalk MK4 110
Flying Dutchman 64
PC Anywhere III 65

Data Base Managers

Clipper \$425
Condor 3 325
DataPerfect **Low Price**
DBase III Plus 375
DB-XL Diamond 115
Fox Base Plus 2.1 194
Genifer 189
Paradox 2.0 Premium 435
PFS: Pro File Call
Powerbase 169
Q&A 3.0 Call
Quicksilver Diamond 329
Revelation Advanced 485
R Base For DOS 425
Reflex 90
Relate & Report 112
VP Info 63

Desktop Publishing

Pagemaker Ver. 3.0 \$475
PFS: First Publisher 2.0 73
Ventura Publisher Call

Graphics

Boeing Graphics \$200
Chartmaster 199
Design Cad 2D & 3D 148
Diagram Master 199
Easy Cad 109
Generic Cad 49
In-A-Vision 270
Microsoft Chart 3.0 225
Newsroom Pro 65
Printshop 33

Integrated

Ability Plus \$145
Enable 352
Microsoft Works 108
PFS 1st Choice 79
Smart System 380
Symphony 465

Languages

Lattice C Compiler \$220
Microsoft C Compiler Ver. 5.0 Call
Microsoft Fortran Ver. 4.1 260
Microsoft Macro Assembler Ver. 5.1 84

Languages

Microsoft Pascal \$176
Microsoft Quick Basic 4.0 59
Microsoft Quick C Call
Ryan McFarlan Fortran 390
Ryan McFarlan Cobol 612
Turbo Basic Call
Turbo C 2.0 Call
Turbo Pascal Call
Turbo Prolog 2.0 90

Multi-User Software

Fox Base + \$299
Microsoft Word 205
Word Perfect 5.0 355
Word Perfect Modules ea 79

Project Manager

Microsoft Project \$299
Super Project Plus 255
Timeline 3.0 323
Harvard Total Project Mgr 355

Spreadsheet

Lotus 1-2-3 \$295
Microsoft PC Excel 250
Quattro 143
Surpass 329
Plan Perfect Call
VP Planner Plus 117

Utilities

Core Fast 75
Copy II PC \$19
Copywrite 39
Cubit 39
Desqview 2.01 72
Direct Access 49
Eureka 99
Fastback Plus Call
Formtools 56
Graph in the Box 2 Call
Mace 55
Microsoft Windows 286 Ver. 2.1 55
Norton Advanced 75
Norton Utilities 48
PC Tools Deluxe 37
Prokey 4.0 70
Q DOS II 49
Rightwriter 75
Sidekick Plus 115
Sideways 39
SQZ Plus 55
Superkey 59
Lightning 79
XTree 35

Word Processing

Microsoft Word 4.0 \$185
Multimate Advantage II 285
Q and A Write 110
Webster Spellcheck 37
Word Perfect Ver. 5.0 Call
Word Perfect Executive 124
Word Perfect Library 2.0 65
Wordstar Pro 5.0 239
Wordstar 2000 + 229

— HARDWARE —

Accessories

Copy II PC Deluxe Bd. \$101
Curtis Ruby + 69
Logical Connection 429
Mach III Joystick 36
Masterpiece 85
Masterpiece + 95
150 Watt Power Supply 69

Boards

AST Call
Rampage/2 Call
Rampage 286 w/512K \$399
Sixpac Plus w/64K 129
All Other AST Products .. Call
EVEREX Call
2MB Above PC/XT w/o Mem 79
3MB Above AT w/o Mem 89
ORCHID Call
Ram Quest Extra PS/2 Call
INTEL Call
Above 286 w/512K 344
J-Ram/J-Laser Call
Orchid Tiny Turbo 289

COMPUTERS

EVEREX Call
286, 10MHz, 0 Wait \$1149
286, 10MHz, 1 Wait 999
286, 12.5MHz, 0 Wait 1349
ACER Call
710 w/o Monitor Call
900 w/o Monitor Call
SHARP Call
PC 4501 \$765
PC 4502 Call
PC 4521 Call
AT&T Call
6286 WGS 1499
6300 WGS 919
6386 WGS, 40 MB H.D. 2999
6386, 135 MB H.D. 4599
ZENITH Call
Super Sport 286/20MG Call
Super Sport 8088/2-Floppies Call
Super Sport 8088/20MG Call
NEC Call
Multispeed-2 Call
All Other NEC Products Call

VGA/EGA Boards

AST VGA + (16 Bit) \$349
ATI EGA Wonder 800 229
Genoa Super EGA Hi-Res + 186
Orchid Designer VGA 309
Paradise Auto 480 179
Paradise VGA Plus 269
Paradise VGA Prof. 399
Vega VGA 275
All Other EGA Products Call

EGA Monitors

Casper \$410
Princeton Ultra Scan 539
Mitsubishi Diamond Scan 509
NEC - Multisync II 599
Zenith 14" Flat Screen 650

Hard Cards

Plus 20 MB \$529
Plus 40 MB 659

Hard Drives

Seagate ST-225 20 MB w/cont \$265
Seagate ST-238 30 MB w/cont 295
Seagate 40 MB AT 251-2 Call
Seagate 80 MB AT 579
Seagate ST-125 w/cont 319
Seagate ST-138 w/cont 399
Priam Call

Monitors

AMDEK Call
410 Amber \$145
MAGNAVOX Call
RGB 255
SIGMA Call
Laserview + 19" Call
SAMSUNG Call
Flat Amber 76
Color w/tilt 249
VIKING Call

Printers

CITIZEN Call
MSP 40 \$285
120 D 146
MSP 50 385
EPSON Call
LQ 500 349
LQ 850 559
FX-850 Call
LASERS Call
Other Lasers Call
AST TURBO PS Call
OKIDATA LASERLINE 6 1379
OKIDATA Call
OKI 320 Call
OKI 321 Call
OKI 390 499
OKI 391 679
STAR MICRONICS Call
NX 1000 179
NX 1000 Color 238

Modems

AZ 2400 INT w/o Soft \$129
Everex 300/1200 w/ Soft 69
Everex 2400 EXT, Error Cor. 189
Hayes 1200 EXT w/o soft 299
Hayes 1200B INT w/ Soft 289
Hayes 2400 EXT w/o Soft 435
Migent Pocket Modem 114
U.S. Robotics 2400 w/o Soft 335

Mice

Z-Nix \$37
Logitech 68
Microsoft Bus w/Paintbrush 92
Microsoft Serial 92
Optimouse w/Dr Halo III 89
Optimouse w/DPG 185

FREE SOFTWARE!

Purchase over \$100 and receive one of these disks absolutely FREE! Purchases over \$250 get two free disks, over \$400 get three, or get all four disks when your purchase is over \$500!
1) MIXED BAG. 2) PC-WRITE. 3) FONT-SET. 4) DR. DATA LABEL.

TERMS: Shipping minimum is \$5.00. AZ orders + 6.7% sales tax. Personal check/company check - allow fourteen (14) days to clear. We accept purchase orders from authorized institutions for 3.5% more than cash price. All returns are subject to our approval. There will be a 20% restock fee. Minimum phone order \$50. All prices are subject to change. Due to copyright laws we cannot take back any open software.

WAREHOUSE DATA PRODUCTS

2727 West Glendale Ave. • Phoenix, AZ 85051

We do not guarantee compatibility



No Charge for
MasterCard or Visa

Servicing our PC buyers with
low pricing and technical
experience since 1979.

Phone Hours:
Monday thru Friday 6:30 am-9:00 pm.
Saturday 9:00 am-5:00 pm MST.


PowerStation

If you have PCs and VAXes, you NEED these products!

For connecting your PC to a VAX, the PowerStation provides the ultimate solution: a VT200 layout keyboard bundled with sophisticated ZSTEM terminal emulation software.

ZSTEM software includes DEC VT240, VT220, VT100, IBM 3101, TEK 4014 and DG D400 terminal emulation.

"Its performance is as perfect as
an emulator can get . . ."

DIGITAL NEWS

For *true* terminal emulation call (800) 663-8702.

KEA Systems Ltd.

#412-2150 West Broadway
Vancouver, B.C. CANADA, V6K 4L9
Tel: 604-732-7411 Telex: 04-352848 VCR
FAX: 604-732-0715



CHAOS MANOR

cially top-of-the-line stuff like I have, and particularly since their latest price increases; but the Macintosh and its software are easy to learn, and everything works. For desktop publishing, the Mac II with its built-in fonts works better than anything we've seen on a PC.

The other day, my son Phillip, the U.S. Navy Midshipman, had to put out a newsletter for his battalion. The material was all written on PCompatibles (the Navy, like the other services, uses the Zenith Z-248). Alex transferred the files from the PC to the Macintosh with Traveling Software's PC Mac Link, then set up the newsletter on the Mac II with Aldus PageMaker. They had the whole job printed on the LaserWriter II in one evening, even though neither had much experience with PageMaker before.

Alex also found a use for the Multi-Finder: you can play Spectrum Holobyte's Solitaire Royale while PageMaker is formatting and sending your documents off to be printed. There are eight different solitaire card games, including two I never heard of before. They play smoothly, and the cards have changeable backs. Changing the backs changes the figures on the court cards. Alex is particularly fond of the vampire deck. Meanwhile, PageMaker was doing a fine job with the newsletter.

What with IBM and the Gang of Nine fragmenting the PCompatible world, Apple looks better every day. There's even a good Lisp for the Mac II.

Photon Paint

Everyone writes paint programs, but MicroIllusion has come out with the neatest Macintosh paint program I've ever seen. They call it Photon Paint, and what you can do with it on a Mac II is just plain spectacular. It makes me sad that I can't draw, since we're in the middle of preparing the Lunar Society's briefing for potential sponsors; I could make some really great color slides with the Datacam screen camera, if only I could draw. Photon Paint says it's compatible with other third-party art and presentation software and can handle imported pictures of any size, so I presume I can scan images into the Mac II, then tweak them with Photon Paint.

We'll be making up our final briefing charts pretty soon; more next month.

Stars!

Years ago, the Los Angeles Science Fantasy Society took a trip out to the desert. One chap had never been outside LA before. He stared up at the sky and was lost.

continued

People are talking about us.

F77L-EM/32—FAST 32-bit processing on 80386s with programs up to 4GB. \$895

F77L—The compiler of choice among reviewers and professionals. New Version 3.0. \$477

F77L-EM/16—Use extended memory to write 15MB programs on 80286s. \$695

Lahey Personal FORTRAN 77—Full 77 Standard and Debugger. New Version 2.0. \$95



**When people talk about FORTRAN
the name mentioned most often is**

Lahey
Computer Systems Inc.

Contact us to discuss our products and your needs. (800) 548-4778
Lahey Computer Systems, Inc. P.O. Box 6091, Incline Village, NV 89450
Tel: (702) 831-2500 FAX: (702) 831-8123 Tlx: 9102401256

"TOPSPEED EARNs A STANDING OVATION!"

—Kent Porter, Dr. Dobbs Journal



"...TopSpeed is surely one of the finest new products introduced to date in the PC arena...DDJ doesn't give unqualified raves very often, but there's no question about it in this case; JPI's TopSpeed Modula-2 is first-rate."

Kent Porter
Dr. Dobbs Journal

"JPI Modula-2 looks like another classic in the making. It generates code as good as or better than leading C compilers and the programming environment is a genuine pleasure to use."

Dick Pountain
BYTE Magazine

"I liked all of the hard-disk space that was recovered after I deleted my BORLAND, MICROSOFT, and LOGITECH compilers, because with TopSpeed Modula-2 all the rest are obsolete."

Robert D. Randall
Donnelley Marketing

In England and Europe contact:
Jensen & Partners UK Ltd., 63 Clerkenwell Road, London EC1M 5NP. Phone: (01)253-4333. Compiler Kit: £59.95, TechKit £34.95, VID £34.95, DOS 3-Pack £109.95 (£119.95 after Dec. 31, 1988).

Handling charges: In UK please phone for VAT and P&P. In Europe, add £6 for up to 3 products, £2 for each add'l product.

The successor of Pascal: JPI TopSpeed™ Modula-2 produces better code than Microsoft C, Turbo C, Logitech Modula-2 and Turbo Pascal 4.0.

Debug with VID: The easy-to-use, source-level debugger. Single-step and trace through source in multiple modules. Examine and modify all variables in symbolic form, including arrays, records, enumerated types and pointers. Point and shoot breakpoints including "One-shot," "Sticky," "Delayed," and "Monitor." Watch both variables and Modula-2 expressions during execution. Automatic variable trace of all variables accessed, and assembler, registers and procedure call-stack trace windows. Package includes symbolic dis-assembler and execution profiler. 72-page manual.

The Compiler Kit includes: High-speed optimizing compiler (3,000-5,000 lines/min. on a PC AT 8MHz), integrated menu-driven environment with multi-window/multi-file editor, automatic make, fast smart linker. All Modula-2 sources to libraries included. **BONUS:** Complete high-speed window management module included with source. 258-page User's Manual and 190-page Language Tutorial.

The TechKit™ includes: Assembler source for start-up code and run-time library, JPI TopSpeed Assembler (30,000 lines/min.), TSR module, communications driver, PROM locator, dynamic overlays, and technical information. 72-page manual.

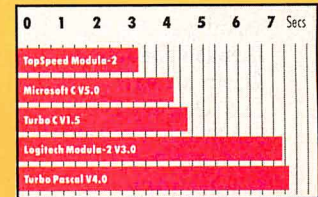
System Requirements: IBM PC or compatible, 384K available RAM, two floppy drives (hard disk recommended).



TopSpeed's seamlessly integrated environment.



VID (Visual Interactive Debugger): power without complexity.



Sieve benchmark measured by the British Standards Institution (BSI)—25 iterations on an 8MHz AT.

Compiler Kit \$99.95

TechKit \$59.95

VID \$59.95

DOS 3-Pack \$179.95*

(Compiler, TechKit & VID)

*\$199.95 after December 31, 1988

To Order:

In the US, call:
1-800-543-5202

In Canada, call:
1-800-543-8452

Or mail us your order with a check, money order, or VISA/MC information. 30-day unconditional money-back guarantee.

Shipping & handling charges:

In North America: add \$5, plus \$2 for each add'l product. CA residents please add applicable sales tax. Overseas: add \$20, plus \$8 for each add'l product.



Jensen &
Partners
International

1101 San Antonio Rd.
Suite 301
Mountain View, CA 94043
Phone: (415)967-3200

TopSpeed and TechKit are trademarks of Jensen & Partners International. Other brand and product names are trademarks or registered trademarks of their respective holders.

Circle 151 on Reader Service Card

Items Discussed

Datacam		MacSpin \$300
instant..... \$545-\$595		D ² Software, Inc.
35mm..... \$875-\$925		P.O. Box 9546
Photographic Sciences Corp.		Austin, TX 78766
770 Basket Rd.		(512) 482-8933
Webster, NY 14580		Inquiry 1017.
(716) 265-1600		
Inquiry 1011.		
Deluxe Paint II		PageMaker
IBM..... \$99.95		IBM..... \$795
Amiga..... \$129.95		Macintosh..... \$595
Deluxe Productions \$199.95		Aldus Corp.
Electronic Arts		411 First Ave. S, Suite 200
1820 Gateway Dr.		Seattle, WA 98104
San Mateo, CA 94404		(206) 622-5500
(415) 571-7171		Inquiry 1018.
Inquiry 1012.		
DESQview \$129.95		Photon Paint \$299.95
Quarterdeck Office Systems		Sky Travel \$69.95
150 Pico Blvd.		MicroIllusion
Santa Monica, CA 90405		17408 Chatsworth St.
(213) 392-9851		Granada Hills, CA 91344
Inquiry 1013.		(818) 360-3715
		Inquiry 1019.
Flicker Fixer \$595		Solitaire Royale \$34.95
MicroWay, Inc.		Spectrum Holobyte
P.O. Box 79		2061 Challenger Dr.
Kingston, MA 02364		Alameda, CA 94501
(508) 746-7341		(415) 522-3584
Inquiry 1014.		Inquiry 1020.
Fractal Magic		Vega VGA \$499
IBM..... \$35		Video Seven, Inc.
others..... \$25		46335 Landing Pkwy.
Sintar Software		Fremont, CA 94538
P.O. Box 3746		(415) 656-7800
Bellevue, WA 98009		Inquiry 1021.
(206) 455-4130		
Inquiry 1015.		VGA Paint \$199
LANtastic \$399		RIX SoftWorks, Inc.
Artisoft, Inc.		18552 MacArthur Blvd., Suite 375
3550 North First Ave., Suite 330		Irvine, CA 92715
Tucson, AZ 85719		(714) 476-8266
(602) 293-6363		Inquiry 1022.
Inquiry 1016.		

can't afford not to have this. Highly recommended.

DESQview vs. OS/2

I presume that everyone knows that DESQview is a sort of MultiFinder for DOS: it lets you keep a number of programs running concurrently. I generally turn off the capability that lets applications run in the background (unless they're communications programs, of course); that way, I have only one program *running* at once, but several are loaded into memory, so that I can jump from one to the other almost instantly.

I have a beta-test copy of the latest version of DESQview. (You should be able to buy it about the time you're reading this.) It has a couple of silly bugs that Quarterdeck's people won't have any trouble fixing. Otherwise, it's very nice.

For one thing, it's a lot smaller than the old DESQview, meaning that you can have larger windows. For another, you can change program parameters on the fly. With the earlier DESQview, you had to reset the system before parameter changes took effect. No more.

The new DESQview doesn't work with IBM's DOS 4.0, but then nothing else works very well with it, either. We can be certain IBM will clean up their act. When that happens, you'll be able to have large disk drives—as large as you like. You can, using the Phar Lap extensions, write programs larger than 640K bytes, and, using Quarterdeck's new API (Application Programmer Interface), you can adapt those programs for smooth data transfers, graphics, and other stuff, as well as have multiple processes at work.

Finally, since it is DESQview, you can run a number of programs at the same time or, like me, keep a number of them in memory and flash back and forth between them.

Given all that, it's hard to understand what OS/2 is going to do for us.

DESQview, after all, runs the programs you already have. In theory, OS/2 can do that—that is, it can run one of your existing programs at a time in a thing called the compatibility box. However, your program will run quite slowly compared to its speed outside OS/2. If you want to run more than one program at a time with OS/2, the programs have to be specially rewritten so they can run under OS/2. The big surprise is that if you get specially rewritten versions of your programs, the results will be disappointing. Even programs written for OS/2 are blooming slow.

continued

Come morning, he was lying fully clothed on the sand, still staring up at the sky and muttering, "Stars!"

You won't get quite that experience with this program, but it's close.

Sky Travel is also published by MicroIllusion. Available for the Commodore 64/128, the Mac II, and the Amiga, this is billed as "an all-encompassing astronomy program" and pretty well lives up to

it. Want to know where the planets are, will be, or used to be? Look at distant galaxies? Find constellations and see them from any point on the earth? Like to know which star was the North Star when the Great Pyramid at Giza was built? Take a guided tour of the universe?

Any of that and more comes with this program. If you or anyone in your family is interested in science or astronomy, you

All the excitement of the Air Force, without shaving your head.

You have a choice:

You can take flight school, about a year of it, get your pilot's license and *then* enjoy the sensation of landing at O'Hare at midnight or catching a bird's-eye view of the Statue of Liberty.



New Microsoft Flight Simulator. It's not a game. It's an adventure.

Or you can do it on a PC. This afternoon. In your office. With the new Microsoft® Flight Simulator® version 3.0.

New as in the most realistic flight simulator available on the PC. New as in a choice of *three* different planes: Lear Jet, Cessna Turbo 182 or WWI Top Gun.

Weather conditions? You decide: Calm, turbulent, sunny, cloudy. Yes, you'll see lightning. Enough to make the whole plane shake.

Flight Simulator also lets you glide, loop, spin, attack, roll out or just cruise inside 10,000 square miles of airspace. And if flight school didn't teach you how, this will. On screen.

Plus it's the *only* simulator with a modem hookup so you can fly with a friend. And check each other out, right from your own screens.

For a heavy dose of reality, go see Flight Simulator 3.0 at your local Microsoft dealer. If that isn't exciting enough?

Go see your local recruiter.

Microsoft®

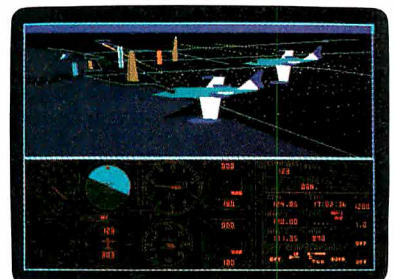
©1988 Microsoft Corporation. Microsoft and the Microsoft logo are registered trademarks of Microsoft Corporation. Flight Simulator is a registered trademark of SubLOGIC Corporation, used under license by Microsoft Corporation.



One cockpit, two windows: One shows where you are in the sky. One shows where you are in the country.



Complete on-screen aircraft library shows detailed specs on all three planes: Lear Jet, Cessna Turbo 182 and WWI Top Gun.



Try this: Hook up our phone modem and head into the wild blue yonder with a friend. Day or night.



Keep your eyes peeled for balloons, towers, mountains, buildings, bridges, you name it. Welcome to the real world.



Nervous? Relax, new Flight Simulator teaches you, on screen, how to do everything... except bail out.

BRIEF™ Users: Now you can have fast

compilation AND an integrated,
productive environment.

Over 5,000 of you were forced to make sacrifices to use BRIEF, The Programmer's Editor. Advanced compilers and new programming environments, like Turbo C and QuickBASIC, took up so much RAM that BRIEF could not fit in the same 640k.

If you wanted to retain BRIEF's uniquely powerful features¹ while working with larger programs, you had to sacrifice speed and continuity. Instead of a tight Edit-Compile-Edit loop, you had to slog through an obsolete Edit-Exit-Compile-Exit-Edit loop.

Now you no longer have to make that sacrifice.

You can enjoy the features¹ that have made BRIEF the best-selling and the best regarded² programmer's editor without sacrificing environment integration.

Version 2.1 of BRIEF can be swapped in and out with a single keystroke — allowing immediate compilation with even the largest compilers: Microsoft C5.0, QuickC, Turbo C, Lattice C, dBLX, FoxBASE+ v2.0, Clipper, etc.

¹ For example: real multi-level Undo (not simply Undo), flexible windowing, unlimited file size, unlimited number of simultaneous files, automatic language sensitive indentation.

² For example:

"The quintessential programmer's editor." — *Dr. Dobbs Journal* "Right out of the box, it's a versatile, extremely powerful editor that handles most any programming task with aplomb." — *Computer Language* "Simple to learn and use and extremely sophisticated. Strongly recommended." — *PC Magazine* "Not only the best programmer's text editor I've ever seen, but it is also a tour de force in the way it was conceived and implemented." — *Computerworld* "So far surpasses users' expectations that it is revolutionary." — *MicroTimes Magazine* "BRIEF is truly outstanding." — *Microsoft Systems Journal*

Current BRIEF Users:

Call Ann for details on 4 other important enhancements. Registered users of versions 2.0 or 2.01 update for only \$35.

Haven't tried BRIEF yet?

BRIEF retails for \$195. Call Ann today for a no-risk, 60-day trial with a full, money-back guarantee.

**Call toll-free today
800-821-2492**

**Solution
Systems**

**541 Main Street, Suite 410
South Weymouth, MA 02190
617-337-6963**

Introducing
BRIEF V2.1

DESQview, on the other hand, runs existing DOS programs about as fast as they ever ran under DOS without DESQview. If you have a lot of programs running in the background, you certainly can slow things down; but that shouldn't surprise you. DESQview and OS/2 both are nothing more than ways to let your programs share cycle time on the CPU chip, and, fast as our machines are, you can overload them. The point is that, in general, your standard DOS program will run faster under DESQview than the specially written version of the same program will run under OS/2.

I am fast coming to the conclusion that OS/2 is just too big and too late to keep up with the competition. If you're in program development, you can't afford not to keep up with where DESQview is heading.

Toning Up

Mrs. Pournelle had just finished the outline and some sample chapters of her new book when her Mannesmann Tally laser printer started spewing out blank pages. This shouldn't have surprised us. We've had that printer a long time, and we've put a lot of paper through it without ever changing cartridges or doing any other maintenance; and since they're all in it together, it should be no surprise that the printer waited for a Friday afternoon with a critical job before it complained.

Actually, it could have been worse. We had a couple of hours before everything closed for the weekend.

A quick inspection of the printer's documents revealed that it is built around the Kyocera laser-printer engine. It doesn't use cartridges of the kind favored by the LaserJet, with its Canon laser engine. Instead, you put in toner. I had a horrible memory of trying to pour toner into an ancient Xerox copier, but that wasn't to be: the toner comes in a sealed container.

Quick calls to Priority One and the local ComputerLand revealed that neither one stocked Mannesmann Tally—or Kyocera—toner cartridges.

"Call Mannesmann Tally," I told Roberta. "They'll know."

Indeed, they did, and there was a store not far from us. The cartridges aren't cheap: \$150 for four of them. On the other hand, they last quite a while. The documents say 3000 sheets, but in our case it was well over 5000. We've been using that machine pretty heavily for months.

Replacing the toner box turned out to be a bit beyond Roberta's strength: she could get the box in place all right, but

when it came time to pull the tape out (thus releasing the toner), she just couldn't do it. I had to come help, although I suspect that Roberta could have done it if she'd been confident that all she had to do was pull harder.

We sealed up the toner well and turned on the printer. It complained that its case door was open. Then it jammed a sheet of paper. There were a couple of other minor glitches, none serious, and probably all caused by our being in a hurry. I cursed the machine horribly, turned it off, and turned it back on.

It worked fine, and now I know how to change the toner box.

Procomm Plus and Zenith

While we were off on our trip, I used the Zenith SupersPort Z-286 portable to keep in touch. Just before we left Los Angeles (by train), I used LapLink to squirt over the entire Procomm Plus sub-directory to the SupersPort. When we got to San Antonio, I called to get the local Tymnet access number, added that to the Procomm Plus menu, and fired up.

The result was goofy. Procomm Plus announced that I was connected at 300 bits per second. Of course, I had set the system for 1200 bps; and when I tried to send anything, Tymnet curled up and died. Clearly, I was trying to communicate at the wrong speed.


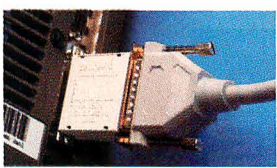

If I altered my program to communicate at 300 bps, it worked fine—except that I was connected at 300 bps, and that's horrible.

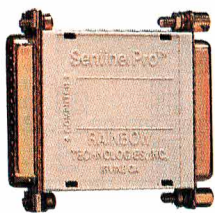
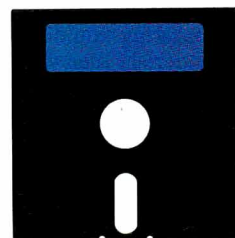
For a couple of days I made do, while asking on BIX if anyone had ever had this experience. After all, the *identical* software had worked perfectly when run on my 20-MHz Cheetah driving the US-Robotics Courier HST modem; why didn't it work now?

I still don't know the answer to that, but I did get things working. There is among the Procomm Plus menus a set of options. One of them is automatic baud rate adjustment. I had that set to On.

When you first access Tymnet, it sends you some stuff at 300 bps. Then, when you transmit back at some other speed—1200 or 2400 bps—Tymnet adjusts. However, the combination of Procomm Plus and the Zenith internal 300-/1200-bps modem in the SupersPort did something else. When the Zenith modem heard that initial 300-bps signal from Tymnet, it locked onto that speed, and it apparently even sent some kind of acknowledgment. Thus, Tymnet thought I was connected at 300 bps. Then, when Procomm Plus started transmitting at

continued

In 1988, \$3.5 billion in micro-computer software will be sold worldwide. During that same time, another \$3.0 billion in sales will be lost to free distribution — better known as software piracy. And right now, Rainbow Technologies' Software Sentinel™ is protecting close to \$1.0 billion in software for developers who never wanted to be part of the free software distribution network in the first place.  The Software Sentinel hardware key is "execution control" software protection. It ships with the software and simply plugs into the PC's parallel port  to be one hundred percent invisible to both user and the software. Users can make as many copies as they want. Make working submasters. Use a hard disk. Virtually anything that can be done with unprotected software. Except start freely distributing that software to other users.  The Rainbow family of Software Sentinel products. Selected by the very big to the not-so-big developers of DOS, OS/2 and Xenix software in worldwide markets. To the tune of close to a billion dollars. So far.



RAINBOW TECHNOLOGIES

18011-A Mitchell South, Irvine, CA 92714 • (714) 261-0228 • TELEX: 386078 • FAX: (714) 261-0260
Rainbow Technologies, Ltd., Shirley Lodge, 470 London Rd., Slough, Berkshire, SL3 8QY, U.K., Tel: 0753-41512, Fax: 0753-43610

Copyright ©1988 Rainbow Technologies, Inc. Software Sentinel and SentinelPro are trademarks of Rainbow Technologies, Inc.
Xenix is a trademark of Microsoft Corporation. OS 2 is a trademark of International Business Machines Corporation.

1200 bps, Tymnet died.

The remedy was to set that automatic baud rate adjustment option to Off and leave it that way. After that, I'd get on at 1200 bps, Tymnet's introductory 300-bps string would show up on my screen as gibberish, then we'd lock on at 1200 bps for the rest of the session. Worked fine.

I still don't know why the Zenith and USRobotics modems work differently with identical software. I expect it's all part of the plot. They really are all in this together.

Winding Down

Once again I've been unable to finish the piles of stuff I laid out. I still owe you a report on FastTRAP, the mouse substitute (I am beginning to like it). I have new advanced versions of Norton Commander and Norton Utilities; if you have a PC and don't have the Utilities, you're nuts; and for that matter, there's really nothing better for cleaning up your disk and organizing things than Norton Commander.

I haven't mentioned GrandView, Symantec's new outline and word processing package: this software is so good you

could write books with it, and I might be tempted to try it except that Q&A Write has been improved again, largely at my suggestion.

When I
tried to send anything,
Tymnet curled up
and died.

I've got a new version of MacSpin for the Macintosh: this is a statistics program designed by some of John Tukey's graduate students. Tukey is one of the top figures in statistics. The program reflects his philosophy of examining your data and playing with it so you understand it before applying various statistical formulas. If you have a Mac and you work with statistics, get this program.

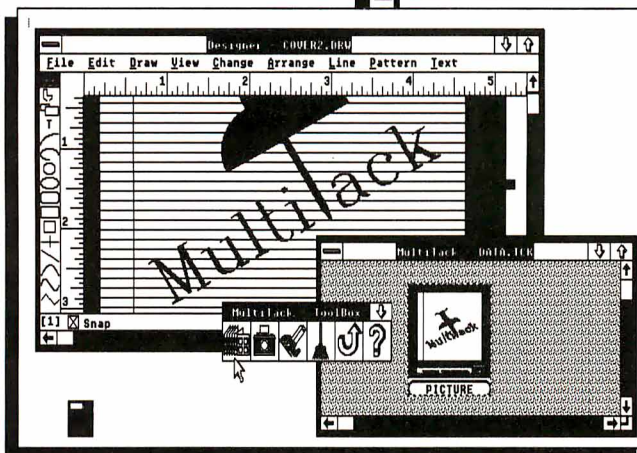
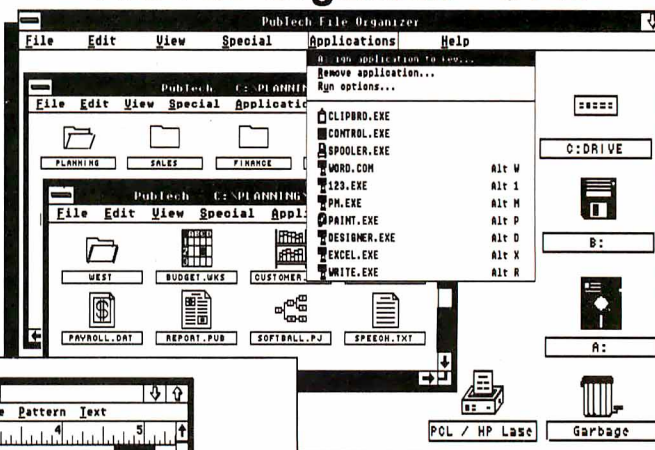
The book of the month is John Keegan's *The Mask of Command*, an entirely different kind of military history by the man that Tom Clancy says is the best military historian alive. The computer book of the month is *LaserJet Unlimited* by Ted Nace and Michael Gardner (Peachpit Press, 2nd ed., \$24.95). I didn't much care for the first edition, but this one is an excellent reference work on everything you ought to know about LaserJet printers.

Almost everything, actually: they don't seem to know that all these machines really are plotting insurrection. ■

Jerry Pournelle holds a doctorate in psychology and is a science fiction writer who also earns a comfortable living writing about computers present and future. Jerry welcomes readers' comments and opinions. Send a self-addressed, stamped envelope to Jerry Pournelle, c/o BYTE, One Phoenix Mill Lane, Peterborough, NH 03458. Please put your address on the letter as well as on the envelope. Due to the high volume of letters, Jerry cannot guarantee a personal reply. You can also contact him on BIX as "jerry".

The File Organizer - \$145

Icons come to IBM or compatible micros with the File Organizer. *Real* icons: print, delete, or copy one file or many by pointing, clicking and dragging icons with a mouse, or use integrated utilities to backup, search and undelete files. Also assign applications to function keys for quick access.



MultiTrack™ - \$79.95

PubTech and MultiTrack are trademarks of Publishing Technologies, Inc. Windows is a registered trademark of Microsoft Corporation. Designer is a trademark of Micrografix, Inc.

Add pages to the Clipboard with PubTech MultiTrack. Build libraries of graphics and text that can be used and re-used in Windows, or use MultiTrack's snapshot utility to capture bitmapped screens to the Clipboard. MultiTrack optionally saves all cuts and copies.

**CALL
1-800-PUBTECH**

7719 Wood Hollow Dr., Suite 260
Austin, TX 78731

PUBTECH
THE FUTURE OF WINDOWS

Aztec C

*Power to go the distance...
Whatever that distance might be*



From real time embedded applications to comprehensive commercial applications on Macintosh, IBM PC, Amiga, Atari, and others, Aztec C has earned a well-deserved reputation as an innovative, tough to beat, rock-solid C development system.

But don't just take our word for it—try it yourself. We know that the best way to understand what puts you ahead with Aztec C is to use it. That's why Aztec C

systems purchased directly from Manx come with a 30-day, no questions asked, satisfaction guarantee. Call for yours today.

We can also send you information that details the special features and options of Aztec C. Plus information on support software, extended technical support options, and all of the services and specialized support that you may need when you're pushing your software to the limits and ... beyond.

MS-DOS Hosted ROM Development Systems

Host + Target: \$750 Additional Targets: \$500

Targets:

- 6502 family
- 8080-8085-Z80-Z180-64180
- 8088-8086-80186-80286/8087-80287
- 68000-68010-68020/68881

Components:

- C compiler for host and target
- Assembler for host and target
- linker and librarian
- Unix utilities make, diff, grep
- Unix vi editor
- debugger
- download support

Features:

- Complete development system
- Fast development times
- Prototype and debug non-specific code under MS-DOS
- Compilers produce modifiable assembler output, support inline assembly, and will link with assembly modules
- Support for INTEL hex, S record, and other formats
- source for UNIX run time library
- processor dependent features
- source for startup

Aztec C Micro Systems

Aztec C is available for most micro-computers in three configurations: The Professional; The Developer; and The Commercial system. All systems are upgradable.

Aztec C68k/Am Amiga
source debugger—optional

Aztec C68k/Mac ... Macintosh
MPW and MAC II support

Aztec C86 MS-DOS
source debugger • CP/M libraries

The following have special pricing and configurations. Call for details.

Aztec C68k/At Atari ST

Aztec C80 CP/M-80

Aztec C65 Apple II & II GS

Standard System \$199

- C compiler
- Macro Assembler
- overlay linker with librarian
- debugger
- UNIX and other libraries
- utilities

Developer System \$299

- all Standard System features
- UNIX utilities make, diff, grep
- UNIX vi editor

Commercial System \$499

- all Developer features
- source for run time libraries
- one year of updates

C.O.D., VISA, MasterCard, American Express, wire (domestic and international), and terms are available. One and two day delivery available for all domestic and most international destinations.

Manx Software Systems
One Industrial Way
Eatontown, NJ 07724

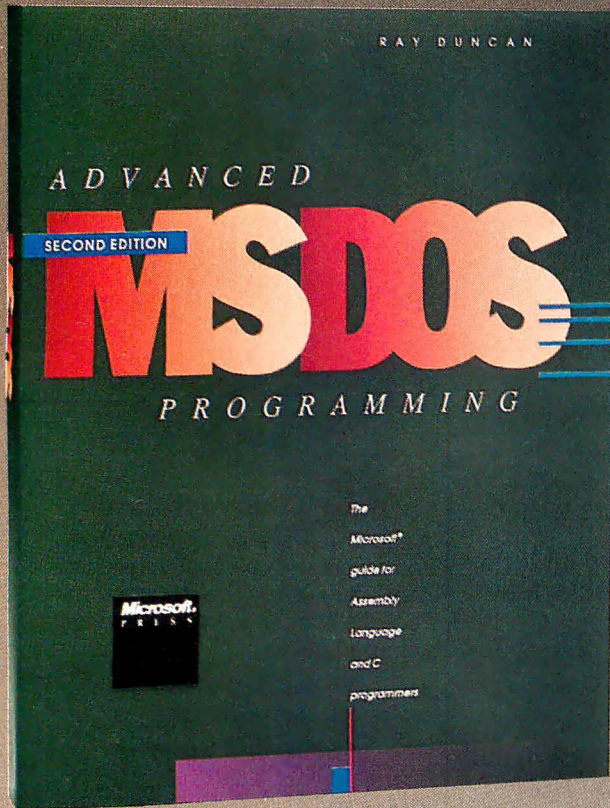
Aztec C is available on a thirty-day money back guarantee. Call now and find out why over 50,000 users give Aztec C one of the highest user-satisfaction ratings in the industry.

Call 1-800-221-0440

**In NJ or outside the USA,
call 201-542-2121**

Telex: 4995812 Fax 201-542-8386

We couldn't have said it better.



And you can bet they'll be saying it again. **ADVANCED MS-DOS PROGRAMMING**—the preeminent source of MS-DOS information for assembly-language and C programmers—has just been expanded and completely updated. Included is a wealth of new data and programming advice in several significant areas:

- ROM BIOS for the IBM PC, PC/AT, PS/2, and related peripherals including disk drives, video adapters, and pointing devices
- MS-DOS through version 4
- version 4 of the Lotus/Intel/Microsoft Expanded Memory Specification
- writing “well-behaved” vs “hardware-dependent” applications
- compatibility considerations for OS/2

“Advanced MS-DOS PROGRAMMING exemplifies how a highly technical book can be both informative and readable.... Duncan’s strengths include a style that is at once easily read, a thorough coverage of the subject matter heretofore unknown, and the frequent use of examples in the form of assembly language programs and code fragments.”

BYTE magazine
John Unger, IBM Issue 1986

“Makes good reading out of even the most elaborate technical descriptions.”

Online Today

“One of the most authoritative in its field.... The book deserves a place on the shelf of everyone who has ever given a fleeting thought to programming the IBM PC and compatibles.”

PC Magazine

Ray Duncan, DOS authority and noted columnist, explores key programming topics including character devices, mass storage, memory allocation and management, and process management. In addition to his expert advice, he has packed his book with a healthy assortment of updated assembly-language and C listings that range from code fragments to complete utilities. These include a fully functional terminal-emulation program, a nifty DOS shell, and the framework for customized critical-error interrupt handlers.

And the reference section in **ADVANCED MS-DOS PROGRAMMING**, detailing each MS-DOS function and interrupt, is virtually a book within a book.

ADVANCED MS-DOS PROGRAMMING. Your key to fast, efficient, robust programs. **\$24.95**

Microsoft® Press *Hardcore Computer Books*

Available wherever books and software are sold.

Or order directly from Microsoft Press. **800-638-3030** (In MD, 824-7300) 8:15AM to 4:15PM (EST).



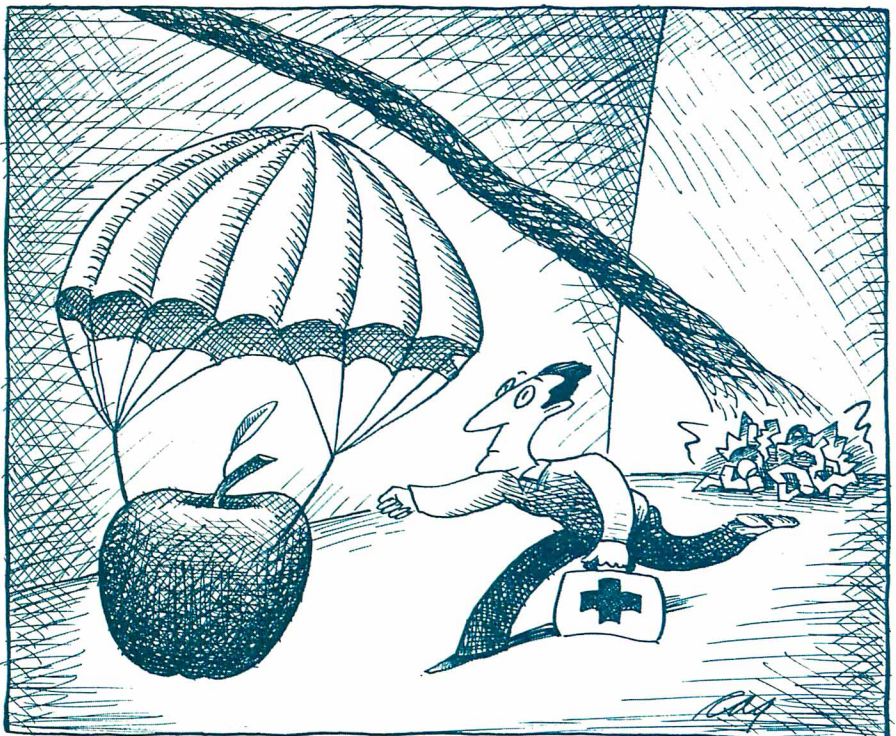
CRASH!

A hard disk wipeout points up the Mac's fragility, and 1st Aid Kit comes to the rescue

OK, OK. I admit it. I got what I deserved. A couple of weeks ago, I managed to trash all 160 megabytes of the external Jasmine hard disk I have hooked up to my Macintosh SE. I was running a bunch of older programs under MultiFinder—a dangerous practice—when all of a sudden, in the middle of writing a file to disk, the cursor froze in the upper right corner of the screen next to the MultiFinder icon. Blam! I hit the reset switch as quickly as I could, but by then it was too late.

I have to tell you, there is nothing more ominous than the silence that greets you when you're waiting for a corrupted hard disk to boot. The damage was nearly total; I'd managed to wipe out the entire directory structure of the disk. Since I'd actually remembered to back up my personal files several weeks earlier, my life wasn't completely ruined, but finding and loading all the original program disks took the better part of a week. This ugly lesson has me out in the stores, checking the prices of tape drives; I simply can't afford the time this has cost me.

I'm also really upset with the Macintosh operating system. Like all Mac owners, I've grown accustomed to the sporadic system crashes that characterize life on the Mac. Every so often, the machine grinds to a halt with no discernible explanation, but usually the only files affected are unsaved documents still open at the time of the crash. I really wasn't expecting to utterly destroy the disk simply by using software. With years of rigorous use of both CP/M and MS-DOS computers, I have never produced such a



disastrous effect without deliberately fiddling with areas I knew I shouldn't touch.

With fonts and desk accessories and MultiFinder and CDEVs and INITs and such, the Mac operating system—none too stable to begin with—has reached the point of no return. My Macintosh system is now more fragile than my MS-DOS machine loaded with its most cantankerous pop-up programs. It's a sorry state of affairs when using my two primary computers fills me with dread.

To make matters worse, Apple claims to be rewriting the operating system from the ground up. This should be cause for rejoicing, but I note that Apple's frequent system releases have been more bug-laden and crash-prone than Microsoft's MS-DOS updates, and Microsoft has managed to compile a pretty dismal record on that front. So what are we going to get from Apple? The equivalent of

OS/2 for the Mac? The mind reels.

Seems to me that it's time the micro-computer industry got its act together. I don't care how it's done, nor which operating system triumphs. As a lowly end user, I'm just tired of excuses, rationalizations, explanations, and the sick feeling in the pit of my stomach every time I use a personal computer. The computer revolution is no longer a new phenomenon; how long must we wait for our data to be safe?

Lifesaver

When the hard disk crashed, I was smart enough to ignore the warning messages that told me to reinitialize the beast; I knew that by so doing I would forfeit any chance I had to peel off some of the lost data. I booted off the Mac SE's internal drive and tried to see if any of the utilities I had would recognize the Jasmine.

continued

Nothing worked. I tried Apple's utilities, Jasmine's utilities, and a couple of long-shot disk-editing tools that I thought might do the trick. Zilch. In desperation, I went out and found a copy of 1st Aid Kit (1st Aid Software, \$99.95), which several Mac hackers had told me was the best product on the market for recovering seemingly dead hard disk drives.

To my amazement, the program did work. It recognized the disk that every other program had told me was gone for good, read through it sector by sector, derived a full directory, and asked me if I wanted to try to resurrect the files. This was a tedious process, as I had to select files one at a time and off-load them onto floppy disks, but I had just about given up hope. And the miracle was not a complete success; many of the files that had been fragmented into discontinuous blocks through normal hard disk use were beyond repair. However, the fact that I was able to salvage even a few files was impressive.

I believe that 1st Aid Kit (not to be confused with Apple's Disk First Aid program) is one of those lifesaving utilities that no Mac owner with precious files should be without. Even if you never use it, you'll sleep easier. If you do need it to recover from a bad crash, either on a hard disk or a floppy, you'll thank all the gods you pray to for its existence.

The documentation that accompanies the program is at least as important as the software itself. The manual contains the most comprehensive and intelligent discussion of the Mac's filing system I've ever seen. It's thorough, logical, and disarmingly easy to read; though the material is technical in nature, you won't have to slog through it. If you've ever been frustrated with Apple's skimpy efforts at documentation, buy 1st Aid Kit for the manual alone.

This one is highly recommended.

Maccessories

On a brighter note, I recently bought myself a couple of dandy Macintosh peripherals and found the perfect software to go with them. The prize of the lot is the ProPoint trackball (Abaton, \$139.95). I'd noticed an unpleasant stiffness in my mouse elbow, so pronounced that it ached for hours after a long session with a graphics program. There's been no recurrence since I retired my mouse and started using ProPoint.

The ProPoint unit itself plugs into the ADB port on either the keyboard or the Mac SE itself. It's about the size of a detached numeric keypad, and it greatly reduces the space you need in your work

Items Discussed

Crystal Quest	\$39.95
QuickDEX	\$60
Greene, Inc. 15 Via Chualar Monterey, CA 93940 (408) 375-0910 Inquiry 1005.	
1st Aid Kit	\$99.95
1st Aid Software, Inc. 42 Radnor Rd. Boston, MA 02135 (617) 783-7118 Inquiry 1006.	
HyperDialer	\$39.95
DataDesk International 7651 Haskell Ave. Van Nuys, CA 91406 (818) 780-1673 Inquiry 1007.	
ProPoint	\$139.95
Abaton 48431 Milmount Dr. Fremont, CA 94538 (415) 683-2226 Inquiry 1008.	

area. My favorite feature is the location of the two buttons to the lower left of the ball. With your fingers on the ball, a large click/drag button rests conveniently under your thumb. A smaller lock button lies directly below it, for use in long-distance dragging.

As a result of this design, you don't have to lift your fingertips from the ball to work the buttons. You can operate ProPoint in much the same fashion as you would operate a mouse; no other trackball I've seen makes the transition this painless. The buttons are built for right-handed people, but if you're a lefty, they're no more inconvenient than the buttons on some other trackballs.

I have been honing my trackball skills with Crystal Quest (Greene, \$39.95), a mindless but addictive shoot-'em-up game. You maneuver a "ship" around obstacles, while nasties converge on you from all directions; you can either shoot at them or avoid them to rack up points. It's wonderfully effective training for eye-hand coordination on the trackball, and I don't feel at all guilty for playing it.

After all, it's part of my work, isn't it?

The other hardware add-on I've acquired is HyperDialer (DataDesk, \$39.95), a telephone-dialing peripheral that plugs into the Mac's sound port rather than tying up a serial port and a modem. It's basically a teeny tone generator that attaches between the handset and the base of a Touch-Tone phone, and it cheerfully plays the little seven-note melodies that represent phone numbers in this digital age.

HyperDialer comes from the same folks who bring you the DataDesk keyboards, and it's a quality item. I passed this product by for some time because I thought it worked only with HyperCard (a logical conclusion, considering the name). Wrong. It can also be driven by QuickDEX (Greene, \$60), a truly marvelous desk accessory for storing free-form text data. QuickDEX is ideal for address material, and a built-in Dial command will send a selected phone number to HyperDialer.

QuickDEX lets you create half a dozen databases made up of individual cards. No field names are required, and a speedy search function is the major operating feature. The fact that there are no stylistic limitations on the text you enter means that you can store notes (as well as phone directories) either in separate databases or all jumbled together. I find it faster to load and much more useful for the way I work than either the outliner desk accessories (like Acta) or the miniature editors (like MockWrite and Mini-Writer).

In many respects, it's the Macintosh equivalent of MemoryMate, my favorite memory-resident program on MS-DOS machines. My only gripe is that the cards are only about a third the size of the Macintosh screen and hold only 12 lines of data, not nearly enough for serious note-taking. But QuickDEX is rapidly becoming indispensable, especially teamed with HyperDialer, and I don't know how I survived without the duo.

These are all relatively inexpensive products, further proof that you don't have to spend a fortune to get quality goods. Any or all of them are definitely worth buying. ■

Ezra Shapiro is a consulting editor for BYTE. You can contact him on BIX as "ezra." Because of the volume of mail he receives, Ezra, regretfully, cannot respond to each inquiry.

Your questions and comments are welcome. Write to: Editor, BYTE, One Phoenix Mill Lane, Peterborough, NH 03458.

**Turn your favorite
C compiler into a
powerful database
manager with the**

C/Database Toolchest



The **C/Database Toolchest™** adds sophisticated file management functions to your Power C™, Turbo C®, QuickC®, or Microsoft® C compiler. With the **C/Database Toolchest™**, your data requires much less disk space than with programs like dBASE®, and you can access your data much faster. Of course the full power of C provides you with an unlimited amount of programming flexibility.

The **C/Database Toolchest™** includes three major components:

- 1) An advanced B+tree library gives you instant access to your data.
- 2) A high-level ISAM library provides you with an easy-to-use C interface, and

3) A complete database manager (with C source code included) shows you how to create impressive applications.

You also receive a comprehensive 350 page manual and a utility for converting dBASE® files.

The **C/Database Toolchest™** supports features that you'd expect to find only in products costing ten times as much. Advanced features include variable length records, variable length keys, multiple keys per index, and multiple indexes stored in a single file. Your data files can contain an unlimited number of records, and each record can be as large as 32K bytes in length.

About the only thing that the **C/Database Toolchest™** doesn't do is cost you a lot of money. We've kept our price low so you can manage your budget as easily as your data.

Now Only \$19.95!

Order now by calling our toll free number or mail the coupon to:

Mix Software
1132 Commerce Drive
Richardson, TX 75081
1-800-333-0330

60 Day Money Back Guarantee
Not Copy Protected ■ Royalty Free
For technical support, please call:
1-214-783-6001



Order Coupon

Name _____
Street _____
City _____
State _____ Zip _____
Telephone _____
Paying By _____ Money Order _____ Check _____
_____ Visa _____ MC _____ AX _____ Disc. _____
Card# _____
Exp. Date _____
Disk Size _____ 5 1/4" _____ 3 1/2"

Qty.	Product	Price	Subtotal
—	C/Database Toolchest.....	\$19.95	—
—	C/Database Library Source..	\$10.00	—
—	B+tree & ISAM library source code	—	—
—	Add Shipping (\$5 USA, \$20 Foreign).....	—	—
—	Texas Residents Add 8% Sales Tax.....	—	—
—	Total Amount of Your Order.....	—	B

Make your programs millions of times smarter

More and more, programmers and workstation builders are using DESQview 2.0 as a development tool. The reason is simple. They can create powerful, multitasking solutions today for the millions of DOS PCs in use today. Solutions comparable to those promised for tomorrow by OS/2.

The API Advantage

Programmers who take advantage of DESQview's API (Application Program Interface) get access to the powerful capabilities built into DESQview—multitasking, windowing, intertask communications, mailboxes, shared programs, memory management, mousing, data transfer, menu-building and context sensitive help.

Bells and Whistles

A program taking advantage of the DESQview 2.0 API can spawn subtasks for performing background operations or new processes for loading and running other programs concurrently. It can schedule processing after an interval or at a certain time. It can use DESQview's intertask communications to rapidly exchange data between programs, share common code and data; or interrupt at critical events. It can use DESQview's menuing and mousing capabilities to create menus. And there's lots more it can do.

Some of the applications under development right now using DESQview 2.0 API Tools: CAD, medical systems, insurance, 3270 mainframe communications, network management, real estate, typesetting, point of sale, education, commodity trading, stock trading and online voting.

80386 Power

80386 programmers can take advantage of the 80386's protected mode for large programs, yet run on DOS and multitask in DESQview—side by side with other 80386 and DOS programs. The breakthroughs that make this possible: DOS Extenders from PharLap Software and AI Architects and DESQview support of these DOS extenders.

DESQview Developer Support

So if you are a developer, looking to create programs with mainframe capabilities, but wanting to sell into the existing base of millions of DOS PCs, we can be very helpful. We offer DESQview API Tools for assembler or C programmers: a debugger, a Reference Manual. And lots more tools on the way.

Plus, we offer DESQview API Developers Conferences. Come learn about the DESQview 2.0 API and 80386 DOS Extenders. Meet 80386 experts as well as those smart people who are creating DESQview 2.0 API workstation solutions.

For more information call or write us.

Bringing New Power to DOS. DESQview 2.0 API Toolkit.



Quarterdeck Office Systems, 150 Pico Blvd., Santa Monica, CA 90405
(213) 392 9851

?!

DO YOU REALLY NEED A LAN?

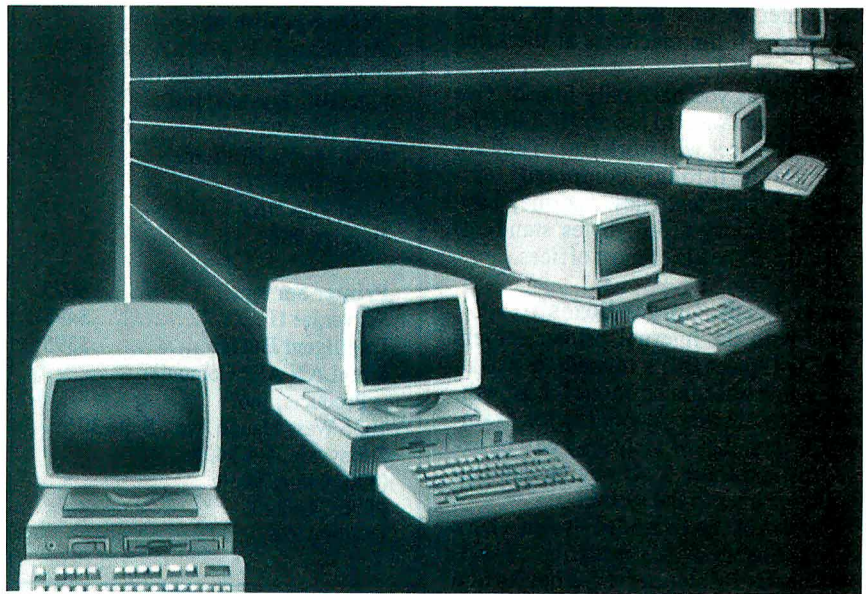
If all you need for your office is a way to share one laser printer, a LAN might be overkill

A recent BYTE survey revealed that 9 out of every 10 large businesses (over 1000 employees) intend to install a local-area network sometime in the next few months. That's a lot of LANs. Many of them will do much to facilitate communications within their companies. Many will allow employees to share files, coordinate their activities, and make better use of expensive resources such as laser printers. Some, on the other hand, will accomplish a great deal less.

One of the first things that I usually notice when I talk to clients about installing a LAN is that their ideas about the network's function are not fully formed. "We've got to communicate," one will say. "I want to move stuff around," another will explain. "We all need to use the printer," a third client will state.

All these factors are valid uses for a LAN, provided these vague requirements can be translated into more specific information. What kind of communication, and with whom? What kind of "stuff" needs moving, how often, and to how many users? What kind of printer, and how often are there overlapping needs to use it?

Answers to these questions will tell you a lot more about the requirements for the LAN. They may also tell you that a LAN really might not be the answer. A good example is the person who will tell you he or she needs a LAN so that several people in the same office can use the laser printer. This is usually thought of as a normal use for a LAN. A laser printer is an expensive resource, and it is fast enough that several people's printing



requirements can be satisfied by one printer, such as the Hewlett-Packard LaserJet II.

As it turns out, though, there are alternatives to buying and installing a LAN. One answer that can be quite useful for a small business or a small department within a large business is a device called a printer server. Essentially, this is a print buffer that is set up to take input from several sources and send it to one or more printers. Exactly how this device works will depend on the individual server.

A typical example of an office where a LAN might be overkill is the law office of Bill Miller, a patent attorney in Ponca City, Oklahoma. Bill has a fairly typical legal office with three attorneys and one legal secretary. He's adding an HP laser printer and he wants it to be available to the entire staff. A LAN could do the job for him, but so could a printer server. It's Bill's computer inventory that tips the balance. As is the case with many offices, not all his computers are IBM PC clones. He also has some Victor com-

puters that probably won't support most LANs.

A printer server will work just fine, though, and it will cost a lot less. He can use the standard serial or parallel output that he would send to any other printer and send it to the server instead. The server will store the text and send it to the laser printer as required.

Printer Servers

Since Bill is planning to use an HP LaserJet II, it makes sense for him to use printer servers designed specifically for this printer. Two of these are the Simp-LAN ServerJet II and the Extended Systems ShareSpool. Both these devices are circuit cards designed to fit into the LaserJet II's expansion slot. They have sockets for four modular plugs like the ones on your telephone. These are for serial connections. The ServerJet II also has a parallel port.

To use these devices, you remove a cover from the rear of the HP, then slide in the card until it is seated. Next, you

continued

attach to your serial port a special DB-25 or DB-9 connector (depending on what your particular computer requires). These connectors have a modular socket to which you attach a piece of standard modular telephone cable. The other end of the cable attaches to the socket on the card that you just installed in the laser printer.

Once you have done this, you can use any computer that will attach to a standard serial connector. I was able to use my old Zenith Z-100 with this device, along with a Tandy XT clone and a Zenith Z-248. All of them worked fine, and the printer servers were able to handle files from all the machines at the same time.

As long as you have only four or five users and you want to use an HP LaserJet II, these devices will work fine. They are controllable through commands embedded in your text files, and they have enough memory (256K bytes standard) to handle the needs of most offices.

Larger Needs, Larger Boxes

While both the internal printer servers above will meet Bill's immediate needs, they won't offer much room for growth. If he adds another secretary, for example, the ShareSpool's capacity will be exceeded, and there's no way he can add another printer to the system.

SimpLAN and Extended Systems have both anticipated this situation. SimpLAN has its Printer Server, a device that allows you to attach six computers and four printers. Extended Systems still limits you to four computers with its desktop publishing MultiSpool, but with this product, you can operate up to three printers.

Because these servers are capable of more complex tasks, they are more complex to use. The MultiSpool, for example, requires that you add a device driver through the CONFIG.SYS file in MS-DOS. This effectively limits its use to PC clones. On the other hand, you can configure the SimpLAN Printer Server using information embedded in the data stream, just as you would with its ServerJet II stablemate. This opens it up to use by a wider variety of computers.

Neither server is particularly difficult to set up and use, although, since MultiSpool will use your computer's parallel output, it probably is slightly easier. The SimpLAN Printer Server I tried uses serial data from the computer. This device is slightly more complex to set up but lets you move the data over longer distances, which could be important where users are a good ways apart.

Items Discussed

LaserJet Series II..... \$2695
Hewlett-Packard
3000 Hanover St.
Palo Alto, CA 94304
(800) 367-4772
(415) 857-1501
Inquiry 957.

MultiSpool..... \$1695
(desktop publishing)
ShareSpool..... \$495
(for HP LaserJet Series II)
Extended Systems, Inc.
P.O. Box 4937
6062 Morris Hill Lane
Boise, ID 83711
(208) 322-7163
Inquiry 955.

Printer Server..... \$695
ServerJet II..... \$495
Intelligent Buffer..... \$395
SimpLAN ASP Computer
Products, Inc.
1026 West Maude Ave., Suite 305
Sunnyvale, CA 94086
(800) 445-6190
(408) 746-2965
Inquiry 956.

While the versions that mounted inside the LaserJet were fairly similar, these devices are quite different from each other. The MultiSpool has only a reset button on the front panel, while the SimpLAN Printer Server has a full control panel. With the Printer Server's panel, you have more control over the flow of information to the printers and are able to use functions such as a pause button to halt output while you add or change paper.

Finally, there's the SimpLAN Intelligent Buffer. This device attaches to the parallel ports of up to three computers and funnels output to a single printer. It's probably the easiest of the lot to use because it requires no configuration in the computers. You simply hook up the cables and run.

Because the Intelligent Buffer supports only parallel connections, the distance the computer or printer can be from the buffer is only about 10 feet. This setup is fine in a small office but could be very limiting in a large one. On the other hand, it is easy to use and works

well with most software. I did have to change its built-in timer so that it would wait for drawings from Generic CADD instead of ejecting them while they were about one-third finished.

Which One to Use?

For offices that have only one printer and no plans to add more users, the obvious choice is one of the devices that fits inside the LaserJet II and lets you connect four or five computers to it. People in these offices have only one printer that they plan to use, and they don't plan to add any more users. This solution is a simple and effective one.

The SimpLAN Intelligent Buffer meets similar needs, but it will support only three users. The SimpLAN's advantage is that it will work with any parallel printer, so your choice is not limited to the HP LaserJet II.

Either of the two more capable printer servers is a good solution for an office like Bill Miller's. Both will allow him to use more than one printer—an option that would be an advantage to a patent attorney who may need to use a plotter to produce drawings. The SimpLAN Printer Server, however, is the best choice for Bill's office. The MultiSpool would not be able to handle even one more user. With the Printer Server, he can send documents to the printer from any of his computers, and because the SimpLAN Printer Server uses serial communications, he can send them from quite a distance.

On the Other Hand...

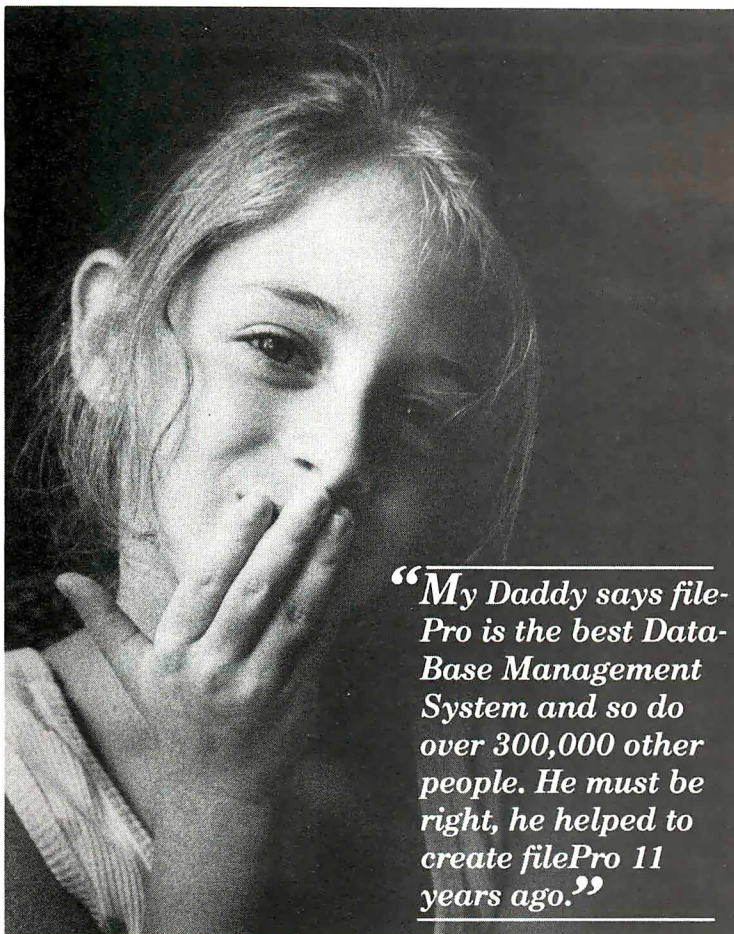
Maybe Bill does need a LAN. If you already generate a hefty load of documents, it would be convenient for others in the office to be able to review them. You might also like to have electronic mail and a way to keep up with the schedules of several busy people.

These issues bring us back to the original question. Clearly, not all offices need a LAN—sometimes there's an alternative. On the other hand, sometimes the need for a LAN is more obvious. How do you tell? Check back here next month. ■

Wayne Rash Jr. is a member of the professional staff of American Management Systems, Inc. (Arlington, Virginia), where he consults with the federal government on microcomputers. You can reach him on BIX as "waynerash."

Your questions and comments are welcome. Write to: Editor, BYTE, One Phoenix Mill Lane, Peterborough, NH 03458.

WANT TO KNOW A SECRET?



"My Daddy says file-Pro is the best Data-Base Management System and so do over 300,000 other people. He must be right, he helped to create filePro 11 years ago."

filePro is the software of choice in FORTUNE 1000 companies, government, thousands of businesses, and VAR's worldwide. The choice is simple when you want portability, a powerful development environment, a fast and efficient database engine and significant productivity when developing applications.

Yet, with all these customers and **file-Pro's** capabilities, we wondered why **filePro** wasn't as well known

as some other DataBase Management Systems. We found out that we had to tell more people about **filePro**, but calling all of you on the phone would take too long. So we decided to let you try **filePro** yourself.

Key Features:

- Total Portability from single-user to multi-user to networks. DOS to XENIX® to UNIX® to ULTRIX®.
- Full Screen Editor; Fast, Easy Layout for Screens & Reports.
- Development Environment, Powerful & flexible - great productivity.
- Relational Database Management System.
- Report Writer: Fast prototyping, and flexibility.
- Award Winning Manual - covers everything filePro offers - cover to cover.

...And Many More Features that will excite you.

"Small Is Better"



The Small Computer Company, Inc.
41 Saw Mill River Road, Hawthorne, NY 10532
(914) 769-3160

XENIX is a registered trademark of Microsoft. UNIX is a registered trademark of AT&T. ULTRIX is a registered trademark of Digital Equipment.

Clip coupon and send check or use your credit card. If you decide to buy **filePro** we'll reimburse the cost of the demo system.

Yes! Let me in on the secret!

Please send me a complete **filePro** demonstration system for only \$50.00.

Name

Phone

Company Name:

Address

City State Zip

Credit Card: ☐ MC ☐ VISA #

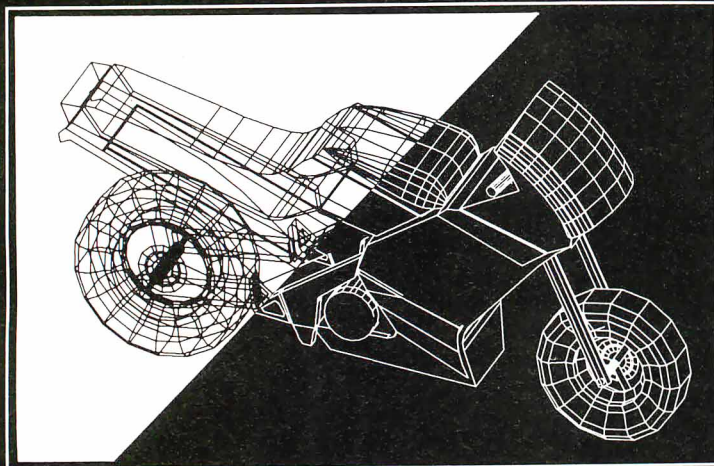
☐ Check Enclosed Expiration Date: / /

☐ DOS: ☐ 386 XENIX
(Hardware) (Hardware)

☐ UNIX: ☐ 286 XENIX
(Hardware) (Hardware)

Your Demonstration System will be shipped within 3 weeks upon receipt of your order.

AW...WHAT THE HECK!



The first question asked by many people is, "Why is *DesignCAD 3-D* priced so low?" The answer? After developing *DesignCAD 3-D* we were unable to decide how the product should be priced. We consulted experts. We used the finest spreadsheets on the market. We took employee polls. We asked our lawyers and accountants for their opinion. We even asked our Mothers, Wives, and childhood Sweethearts! Finally in the greatest American Tradition, we said, "Aw... *What the Heck! Let's see the other guys beat this price!*" *DesignCAD 3-D* sells for \$299 complete. No add-ons, nothing else to buy!

DesignCAD 3-D is a complete 3-Dimensional CAD system. It offers most, if not all, the features found on programs costing more than \$3000! In fact, *PC Magazine* says, "For a low-cost, self-contained 3-D package *DesignCAD*'s range of features steals the show. The package offers more than adequate features for a wide range of professionals and hobbyists alike."

Once again, American Small Business Computers has proved that you don't have to spend a lot of money to get quality software. *DesignCAD 3-D* provides features such as Shading, Solid Object Modeling, Hidden Line Removal, Cross Sectioning capability, ability to output shaded drawings to laser printers, dot-matrix printers, or pen plotters, extensive file transfer capability, *all for only \$299!* No other 3-Dimensional CAD system can come close to providing the price/performance of *DesignCAD 3-D*.

There is a very important reason to buy *DesignCAD 3-D* other than price: PERFORMANCE! *DesignCAD 3-D* provides complete 3-Dimensional drawing capabilities. It's not a "warmed-over" 2-D program. *DesignCAD 3-D* allows you to draw any entity in 3-D space. This means, for example, that you can draw a curve in the shape of a spring. You can draw a circle or arc at ANY angle on ANY plane.

DesignCAD 3-D allows up to 4 simultaneous views - any angle or perspective - on the screen. *DesignCAD 3-D* also provides complex extrusions—linear, scalar, and circular. Extensive 3-D text capabilities and auto-dimensioning are provided, *at no extra charge, of course!*

DesignCAD 3-D almost certainly is compatible with the computer system you now own. *DesignCAD 3-D* supports more than 200 dot-matrix printers, at high resolution. *DesignCAD 3-D* supports more than 80 plotters, and most digitizers, mice, and graphics adapters available for "PC and PC Compatible" systems. Shaded and wireframe models can be output to the printer or plotter YOU own.

DesignCAD 3-D provides the capability to read drawings from most other CAD systems (*DesignCAD/ProDesign II*, *AutoCAD's DXF*, *Hewlett Packard's HPGL*, and *IGES*). *DesignCAD 3-D* will also write GE, and POSTSCRIPT files. This file exchange utility is included at no extra charge, of course.

DesignCAD 3-D does not require expensive graphics adapters and monitors - even shading can be done on ordinary displays, such as the Enhanced Graphics Adapter (EGA), Color Graphics Adapter (CGA) and Hercules Monochrome Adapter. *DesignCAD* also supports many of the ultra high resolution graphics adapters, with more hardware being supported daily.

However, the best reason to buy *DesignCAD 3-D* is not the low price. It's not the outstanding performance. It's not the extensive hardware compatibility. *The best reason to buy DesignCAD 3-D is for its amazing ease of use!*

What else do you need to know about *DesignCAD 3-D*? Only this: "Included at No Extra Charge." What is included at no extra charge? **EVERYTHING! \$299 BUYS IT ALL!**

\$299

DesignCAD 3-D

Oh yes, we also market a 2-Dimensional version of *DesignCAD 3-D* with special drafting and design functions. Can they work together? Naturally... Our Mothers, Wives, and childhood Sweethearts would see it no other way! The price?... **\$299, of course!**

How do you get one? See your local computer store or dealer, or contact:

To quote *PC Magazine*...

"*DesignCAD 3-D*, the latest feature-packed, low-cost CADD package from American Small Business Computers, delivers more bang per buck than any of its low-cost competitors and threatens programs costing ten times as much."

American
Small Business Computers, Inc.

327 So. Mill Street • Pryor, OK 74361
Phone: (918) 825-4844 Fax: 01-918-825-6359
Telex: 9102400302

Write or phone us for FREE DEMO DISK and information on *DesignCAD 3-D* and *DesignCAD 2-D* products.



VLSI DESIGN AND NETWORK HELP

A look at a CAD package and a network troubleshooting application

Although a large number of generalized CAD systems (such as VersaCAD, Claris CAD, MicroCAD, and others) are currently available for the Macintosh II, those that focus on very-large-scale-integration circuit design are almost nonexistent. It's a shame, too, since the very features of a Mac II—its high-resolution color graphics and built-in math coprocessor—that make it so suitable for CAD work also make it suitable for VLSI design. It also happens that one good system for teaching and researching VLSI design techniques doesn't come from a commercial vendor: It's the Magic system from the computer science division of the electrical engineering and computer sciences department of the University of California at Berkeley.

Spurred on by the need for such software on low-cost workstations and the availability of the source code from Berkeley, the University of Chicago is investigating the porting of Magic to the Mac II running A/UX. We've undertaken this investigation despite the fact that Magic has been superseded in recent years by better commercial Unix-based VLSI design tools because these packages are currently expensive (\$20,000 to \$30,000) and the source code is not available for porting.

First, let me explain what Magic is and then what we're doing. Magic and its related VLSI tools all run under various flavors of Berkeley Unix, which isn't too surprising given their origins. Naturally, the software will run on VAXes running 4.2 and 4.3 BSD, as well as under DEC's Ultrix, Sun 2s and 3s running SunOS

(versions 2 and 3), and under OSx on a Pyramid minicomputer.

Magic lets you design and modify VLSI circuit layouts using an interactive, multiwindow display system. Magic works with a color graphics display workstation and needs a mouse or a graphics tablet. Magic enables you to design basic circuit cells and assemble them into complete logic systems. Unlike some other VLSI layout editors on the market, Magic does not just automate electrical drafting with its color display. It understands some basic "facts" about how circuits operate. This built-in knowledge base permits Magic to provide a number of design aids that are especially helpful in learning VLSI design methods and in validating a circuit topology.

Built-in Rule Set

Magic "perceives" how logical components can be connected and understands how a transistor functions. It actually includes a built-in hierarchical circuit extractor to provide high-level layout checking. When you're using Magic to create a VLSI layout, its built-in rule set constantly monitors your design and editing. When you attempt to create a structure that violates its rule set, Magic warns you of the inconsistency. Magic includes a function known as Plow (probably from its operation on the display) that can compact or stretch the dimensions of the circuit cells. Connecting the modified cells is also a snap since Magic provides a set of routing tools that allow you to make the necessary (and optimized) interconnections among larger circuit components.

The rule set programmed into Magic follows the Mead-Conway simplified style of design. These rules allow VLSI novices to create working designs quickly, supported by Magic's design aids. There are drawbacks associated with Magic's Mead-Conway implementation, of course. The most serious is that component density is compromised by its

simplified rule set, which doesn't let you cram as many components into a given physical space as some sophisticated designers might like or as would be possible under more complex rules and their resulting structures.

In VLSI design parlance, Magic permits only "Manhattan" designs, where the topology of the cell edges is vertical or horizontal. Put another way, wedge or corner design topologies cannot be accommodated directly. According to professional circuit designers who have used Magic, the simplified rule set results in a loss of theoretical circuit density of about 7 to 10 percent. While such density losses may be important in commercial VLSI applications, they mean practically nothing in instruction and research, where the function of the design is to educate, not necessarily to be cast in silicon.

Magic comes as part of a total VLSI design and analysis package from Berkeley called VLSI Tools. The package includes more than a dozen different programs, authored by Gordon Hamachi, Robert Mayo, John Ousterhout, Walter Scott, George Taylor, and other researchers outside Berkeley.

In addition to Magic, the design package offers a timing analyzer, known as Crystal, that helps circuit designers find performance problems in the design; a logic equation converter (Eqntott) that converts logic equations into a truth-table format for design input; and a high-level description compiler (Peg) that compiles a high-level description of a finite-state machine into logic equations that can be input into the layout tools for automatic layout and finite-state-machine optimization. A separate program, called Spice2summary, provides summary information about a circuit's operating speed, power, and electrical properties as it has been designed using Magic.

Magic needs a color display with enough bit planes to render all the circuit

continued

layers clearly. Single-bit-plane monochrome monitors can display Magic designs, but the resulting use of hatched and dotted lines makes it tough to keep your layers clear. The color displays supplied with VAXstation, AED, Sun, Apollo, and Lexidata workstations can be used with the monitor drivers supplied. At the University of Chicago we teach VLSI using Magic on Sun-3/160s that include 19-inch, 8-bit-plane color monitors. On Suns, Magic requires the Sun-Tools windowing environment to display its multiple windows (display, command, etc.). Sun versions for X-Windows, NeWS, and Open Look do not yet exist.

Slow Progress

At the University of Chicago we are trying to port Magic and the other Berkeley VLSI design tools to run under A/UX on Mac IIs. The progress so far has been slow for several reasons. First of all, A/UX is a System V release, and Magic was developed under Berkeley Unix and is full of "Berkeleyisms." Second, we need to write color-output A/UX console drivers for the Mac II's 13-inch RGB monitor. Furthermore, version 1.0 of A/UX is excruciatingly slow for graphics operations (we're hoping that versions 1.1 and 2.0 will be much faster).

On a Mac II, Magic really works best on a 19-inch RGB monitor like the Super-Mac Trinitron unit, for which a special A/UX driver must also be written. Certainly, 256 different colors are adequate for rendering circuit layers and cells, but when the new 24-bit Mac II color cards become more prevalent, I expect that Magic drivers will be written to take advantage of their multimillion-color display capabilities.

Almost any interested designer or researcher can obtain the Berkeley VLSI Tools since they were developed, in part, with National Science Foundation grants, giving them a kind of public domain status. The price (approximately \$100) reflects the costs of preparing and mailing a nine-track tape (1600 or 6250 bits per inch) that contains Magic, the other tools, and their combined documentation (ditroff source files and Unix man pages). The tape contains about 20 megabytes of Unix tar binary files, including installation scripts for BSD 4.3 and Sun OS 2.0.

As I mentioned, we've used Magic and its related tools for the last couple of years in my department to teach VLSI. Because it is easy to install and maintain on our Unix workstations and minicomputers, it has worked well in our instructional and research situations. That's the

Items Discussed

InterPoll NetWork Administrator's Utility\$129
Apple Computer, Inc.
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010
Inquiry 1150.

Magic VLSI Tools \$100
Computer Science Division
Electrical Engineering and
Computer Sciences Department
University of California
Berkeley, CA 94720
(415) 642-3214

big reason we're so closely following the effort at A/UX ports of programs such as Magic. While we don't expect A/UX Mac IIs to replace Suns and Apollos in our department or on our campus, we do expect them to turn up in a number of locations, because of the great Apple University Consortium price and their ability to run both Unix and Mac software—a big win in our environment.

InterPoll—An AppleTalk Network Management Tool

Network management ranks right up there with ingrown toenails, fever blisters, and sunburn as being both annoying and painful. Although my experience with managing AppleTalk networks leans toward the annoying side of that duality, it's still not one of my favorite duties.

One example typifies the kind of problems that crop up with a network. Recently, some of my students and I spent several days trying to figure out why a Mac II on a lab LocalTalk network wasn't showing up under TOPS when we looked from other TOPS nodes on the same network. We replaced the LocalTalk connector and the section of cable leading into it, and still it wouldn't show up. We were about ready to pull out all our cabling and install new cables—a bad scene—when we came across Apple's InterPoll NetWork Administrator's Utility.

We fired this baby up, and lo and behold, we found the problem: a broken cable at the opposite end of the network. No, I'm still not sure *why* this made the Mac II at the opposite end of the network disappear, but at least I knew *what* the

problem was. With the recabling disaster averted, I played with InterPoll some more to find out what it could and couldn't do. As far as I can tell, it's based on the old freeware program called NetCheck 2.0 that used to be found on several on-line services (including AppleLink) and was useful for monitoring AppleTalk networks.

What the Tools Can Do

InterPoll encompasses a bunch of tools, all of which are pretty helpful. The list includes ones that give you a complete or selective list of devices that are active on any AppleTalk network (although I have yet to try it over EtherTalk) and help you create a network topology map, perform network integrity tests (the tool we used successfully to find our busted cable), report on the versions of the systems files being run at each AppleTalk node, and report network status across inter-network bridges (such as the Kinetics FastPath and Hayes InterBridge). Should your desires tend in that direction, InterPoll can also create readable network management reports.

InterPoll runs on a Mac II, SE, or Plus running System Tools 6.0.2 and comes with three disks: the InterPoll administrator's disk (for the network manager), an 800K-byte workstation disk (for each user on the network), and a 400K-byte version of the workstation disk. You'll receive a decent manual, too. The AppleTalk Responder INIT has to be installed in the System Folder for InterPoll to work properly.

InterPoll does its dirty work by using five of the AppleTalk protocols: the Name Binding Protocol (NBP) to find network devices, the Link Access Protocol (LAP) to find unnamed devices, the Echo Protocol (EP) to determine link integrity and performance, the Printer Access Protocol (PAP) to get information about the status of printers on the network, and the AppleTalk Transaction Protocol (ATP) to get general system information.

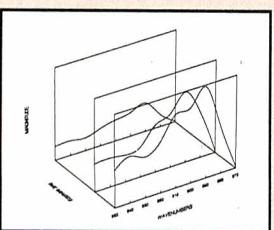
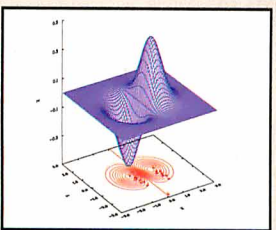
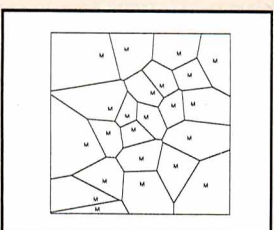
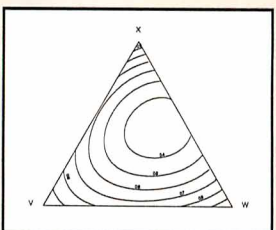
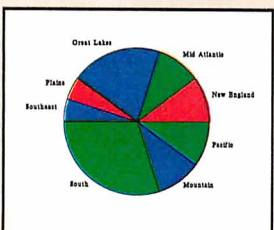
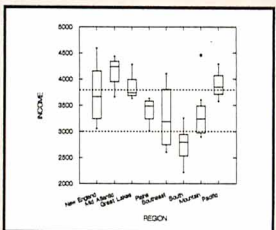
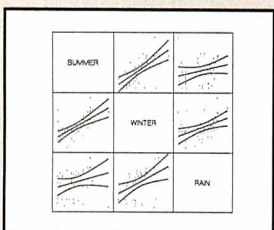
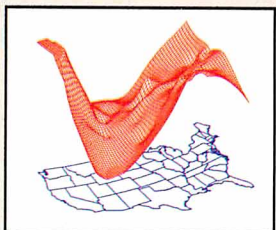
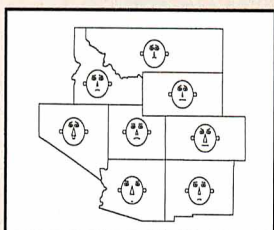
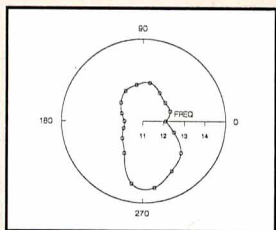
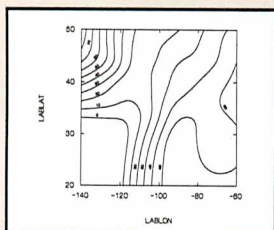
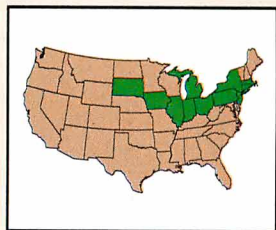
If you have AppleTalk networks, InterPoll is a handy item to keep in your toolbox. It certainly beats pulling new cable. ■

Don Crabb is the director of laboratories and a senior lecturer for the University of Chicago department of computer science. He is also a consulting editor for BYTE. He can be reached on BIX as "decrabb."

Your questions and comments are welcome. Write to Editor, BYTE, One Phoenix Mill Lane, Peterborough, NH 03458.

Systat. Because other statistics and graphics packages are not enough.

Systat now offers more statistical graphics than any other PC or mainframe package. And we still give you less bulk with more statistics.



Statistics

Basic statistics, frequencies, t-tests, post-hoc tests
Multiway crosstabs with log-linear modeling, association coefficients, PRE statistics, Mantel-Haenszel, asymptotic standard errors Nonparametric statistics (sign, Runs, Wilcoxon, Kruskal-Wallis, Friedman two-way ANOVA, Mann-Whitney U, Kolmogorov-Smirnov, Lilliefors, Kendall coefficient of concordance) Pairwise/listwise missing value correlation, SSCP, covariance, Spearman, Gamma, Kendall Tau, Euclidean distances, binary similarities Linear, polynomial, multiple, stepwise, weighted regression with extended diagnostics Multivariate general linear model includes multi-way ANOVA, ANCOVA, MANOVA, repeated measures, canonical correlation Principal components, factor analysis, rotations, components scores Multidimensional scaling Multiple and canonical discriminant analysis, Bayesian classification Cluster analysis (hierarchical, single, average, complete, median, centroid linkage, k-means, cases, variables) Time series (smoothers, exponential smoothing, seasonal and nonseasonal ARIMA, ACF, PACF, CCF, transformations, Fourier analysis Nonlinear estimation (nonlinear regression, maximum likelihood estimation, and more).

Graphics

Overlay plots Drivers for most graphics devices
Two dimensional: Error Bars Scatterplots Line and Vector Graphs Vector, Dot, Bubble and Quantile Plots Bar Graphs (single, multiple, stacked, range) Box plots (single and grouped) Stem-and-leaf diagrams Linear, quadratic, step, spline, polynomial, LOWESS, exponential smoothing Confidence Intervals and ellipsoids (any alpha value) Smooth mathematical functions Rectangular or polar coordinates Log and power scales ANOVA interaction plots Histograms (regular, cumulative, fuzzy) Stripe and jitter plots Gaussian histogram smoothing Scatterplot matrices Voronoi Tessellations Minimum spanning tree Maps with geographic projections (U.S. state boundary file included) Chernoff faces Star plots Fourier plots Pie charts Contour plots on regularly and irregularly spaced points Control charts and limits Three dimensional: Data plots Smooth function plots Vector plots Linear, quadratic, spline, least squares surface smoothing Three-dimensional type fonts.

Data Management

Import/export Lotus, dBase, and DIF files Full screen data editor Full screen text editor Unlimited cases Missing data, arrays, character variables Process hierarchical, rectangular or triangular files, irregular length records Character, numeric, and nested sorts Merge and append large files Unlimited numeric and character variable transformations Subgroup processing with SELECT and BY Value labels and RECODE Statements Macro processor with programming language, screen control, file manipulation, applications generation, and report writing.

SYSTATTM

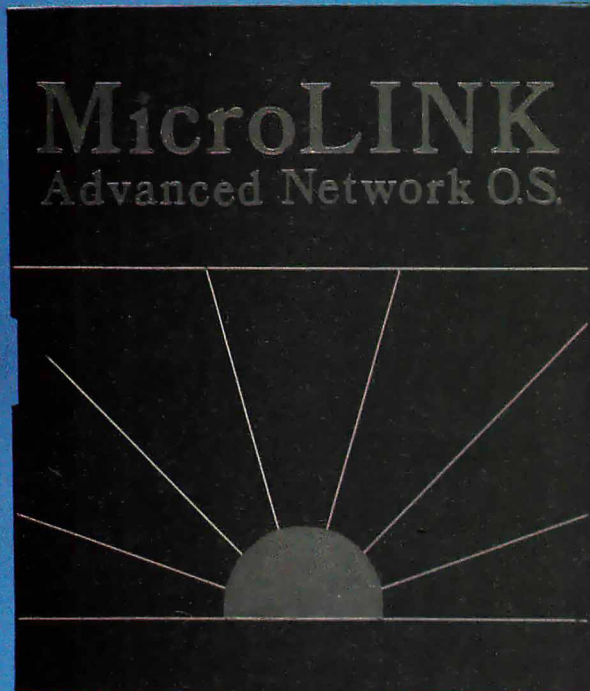
Systat operates on IBM PCs and compatibles, MS-DOS and CP/M machines, several UNIX minicomputers, and the VAX/Minovax. Menu/windowed Macintosh version also available. Single copy price \$795 USA and Canada, \$895 Foreign. Site licenses, quantity prices and training seminars available. No fees for technical support. Statistics and graphics available separately.

For more information, call 312 864.5670 or write Systat Inc., 1800 Sherman Avenue, Evanston, IL 60201.

The following are registered trademarks: CP/M of Digital Research, Inc., IBM PC of IBM, Inc., MS-DOS of Microsoft, Inc., Macintosh of Apple Computer Inc., UNIX of AT&T and VAX of Digital Equipment Corporation.

Systat. Intelligent software.

Are you tired of seeing **RED?**



If you are developing a network application for the PC or PS/2, you should consider **MicroLINK Network Developer's Kit**.

MicroLINK Network Developer's Kit will give you a complete SMB protocol redirector, server and memory management for use on any standard NETBIOS.

Very High Performance

MicroLINK is a very high performance network operating system. In most environments it is 75% faster than the so-called industry leader.

Easy to Implement

MicroLINK comes as stand alone software modules. **MicroLINK** can be interfaced through MS C or MASM calls.

Low Memory Requirements

MicroLINK requires less than 40k bytes for a user, or 64k bytes for a **nondedicated** server. **MicroLINK** can also use EMS memory for even lower memory requirements.

Four Nodes Complete

MicroLINK Network Developer's Kit gives you four (4) nodes to develop your applications on. You can easily purchase additional nodes as you need them. You will also receive NETBIOS interfaces for WD8003E and WD8003ET/A ethernet adapters and others. Complete developer's documentation is included which outlines all network programming interfaces.

For network developing without the headache,
MicroLINK Network Developer's Kit

Available at Programmer's Shop, Programmer's Connection and Programmer's Paradise

Simple NET Systems, Inc. • 545 West Lambert Road • Suite A • Brea, California 92621

(800) 262-8010 • IN CALIFORNIA (714) 529-8850 • FAX (714) 529-2413

MicroLINK is a registered trademark of BCSOFT Corp. Other brand and product names are trademarks of their respective holders.



X.400 GROWS UP

The final version of this international standard should advance global E-mail interconnectivity

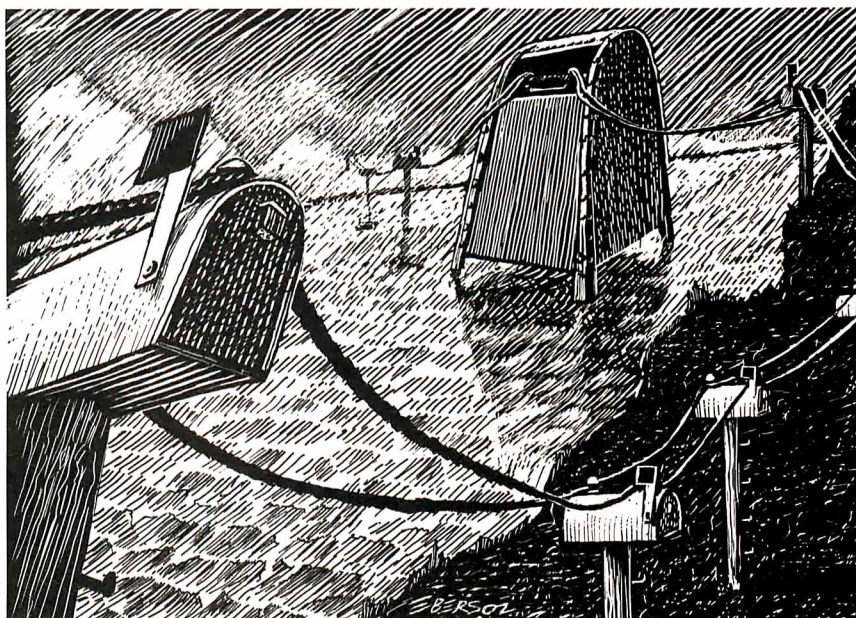
Electronic message delivery has entered a new era. This year, deemed the "Year of Interconnectivity" by the Electronic Mail Association, will see the approval of the final version of X.400, the international standard for interconnecting electronic mail systems.

In 1980, the International Telegraph and Telephone Consultative Committee (CCITT) initiated formal work on a universal interconnection standard via a working group referred to as a "special rapporteur." In 1984, the first X.400 standard was hammered out in CCITT volume VIII—Facile VIII.7, known as the "Red Book."

Since 1984, the standard has been undergoing revision. The 1988 version, though not ratified at this writing, was expected to be ratified in November. The new X.400 standard will be contained in the "Blue Book."

Before X.400, residents of the so-called global village who needed worldwide communications capability made do with adequate, but antiquated, tools such as the telex—a real-time, dial-up communications technology from Western Union. But in today's high-tech environment of global competitiveness, the telex machine is too slow and unreliable, and it's useless for binary file transfers.

It's a small leap from the telex to the Advanced Research Projects Agency network, a worldwide E-mail network used first by the military to link its research labs and installations. ARPAnet deteriorated (some say evolved) into several



other networks, such as Usenet and Bitnet, that still function today. But years of neglect and apathy have taken their toll on these networks; they resemble the root system of a weeping willow more than a sophisticated and efficient messaging system.

Until X.400 became a reality, the idea of a universal electronic messaging system that worked on any mainframe and down to the personal computer level and allowed anyone to send a message to anyone else, worldwide, regardless of what E-mail system he or she used, was only so much science fiction. But X.400 will move us from fiction to fact.

X.400 provides for the sending of messages, files, and even telexes among different mainframes. Users of X.400-compatible E-mail systems won't have to concern themselves with the idiosyncrasies of host-system protocols.

The X.400 standard outlines the architecture, protocols, and message "envelope" formats that allow E-mail users to exchange messages independently of

the E-mail systems they use. For example, X.400 makes it possible for DEC's All-In-1 to swap messages with Data General's CEO, and MCI Mail users can trade messages with users of CompuServe's EasyPlex E-mail service.

"Four years ago, the ink was just drying on the X.400 draft standard," says Richard Miller, president of Telematica, a data communications consulting firm specializing in electronic messaging protocols. "The childhood of X.400 is at an end, and with some 40 vendors now offering X.400-compatible products, we're seeing an era of 'plug and play' systems hitting the market." Products include X.400-compliant E-mail systems and X.400 gateways, which allow interconnection between proprietary E-mail systems that do not support X.400 internally.

Inside X.400

X.400 is part of the International Standard Organization's Open Systems Inter-

continued

X.400

*is the first stable
protocol in OSI's
application layer.*

connection model. OSI's seven layers can be compared to a cake; each successive layer builds on those below it. The lowest layers, which are closest to the communications hardware, make certain that the raw bits of data make it through the physical medium intact. The upper layers preserve the integrity of the data; they ensure that the bits sent have the same meaning when you receive them at your end. X.400 is the first stable protocol in OSI's application layer—the highest level in the protocol stack.

To establish a truly universal store-and-forward (E-mail) network, you need to specify the interface details for all E-mail systems to be interconnected. X.400 provides the technical glue for these systems and their interfaces, and it does so in enough detail to satisfy the needs of anyone who wants to build his or her own X.400 message-handling system (MHS). Not surprisingly, the language of the X.400 specification is technically precise. Some critics say it's too complex, but X.400 products are alive, well, and in use.

The X.400 specification itself contains several components. First, the

MHS is a group of interconnected store-and-forward systems. Messages themselves can contain any kind of electronic data. The messages you generate are sent to a User Agent, which functions like a post office box. It provides a place for messages to be delivered to each user on the system. The UA acts on your behalf to exchange messages between your keyboard and the Message Transfer Agent.

MTAs function as post offices. Each MTA serves a particular group of UAs, just as your local branch post office handles your paper mail. It collects messages, sorts them by destination, and then forwards them, in bulk, over the network.

The MTA also routes messages to all

recipient UAs and makes copies automatically if a message is being sent to several people in a distribution list. Likewise, the MTA sorts and delivers incoming messages. The X.400 P3 protocol defines the method for submission and delivery of messages between a UA and an MTA.

MTAs perform these store-and-forward functions via the X.400 P1 protocol, which defines the rules of the road for how interactions between MTAs take place. P1 also defines how a particular system deals with the delivery of message envelopes. All the MTAs working together are defined as a Message Transfer System. Thus, ACME's corporate mainframe in Toledo, Ohio, is considered an MTA, as is the branch office mainframe in Hoboken, New Jersey. The interconnection of these MTAs is the MTS.

There also may be direct interaction between cooperating UAs on, say, the same local-area network. This is defined by the P2 protocol and includes the capability for services such as finding out if the recipient UA has enough room to hold the message you've sent, and sending an

How the competition stands

Introducing the modem with a sleek new stand-up* design. Telebit's new T1000 Multi-Speed modem. The modem that not only looks different, but is different. With more features. More performance. And a surprisingly low price.

More modem for less money.

What makes the T1000 so different? For one, you get a choice of more speeds. The T1000 can send and receive data at 300, 1200, 2400, or 9600 bps using ordinary dial-up phone lines.

So the T1000 can talk to your installed base of low-speed modems, plus the large installed base of Telebit® and other PEP™ high-speed modems.

But it costs about the same as a

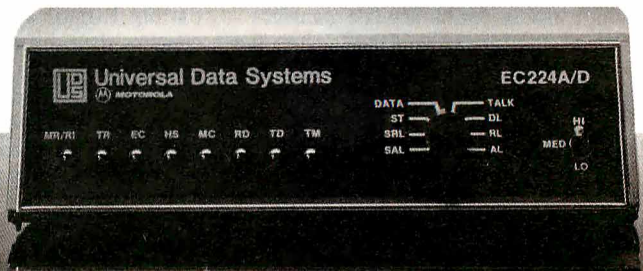
2400 bps error-free modem.

Another difference? The T1000 runs at 9600 bps with any type of data—without compression. Error free. With MNP and PEP error detection and correction.

The T1000 fits right in.

The T1000 Multi-Speed modem even talks Hayes—right from the box. And if you're using the AT command set or even Smartcom III software, we're compatible. You won't need new software. And you won't need new commands.

The T1000 also has internal support for the most widely-used communications protocols—Kermit, Xmodem, Ymodem and UNIX's UUCP. So you can transfer files up to 3 times faster than any other modem.



acknowledgment when the recipient UA has read the message.

Sorry, No Listing

To have any kind of global interconnected network, you need a directory of some sort. The standard for establishing such a directory is X.500. Even though some systems, such as MCI Mail and CompuServe, currently provide interconnection via X.400, users of either system must already know the address of the intended recipient; there is currently no provision to look up a CompuServe user's electronic address from within MCI Mail.

Enter X.500. Think of it as a kind of digital directory assistance and then some. According to the X.500 standard (which is expected to be ratified along with X.400), individual entries will contain information "corresponding to each of the communications methods by which that person can be reached, selected from an open-ended list which includes at least the following: Telephony, E-mail, telex, Integrated Services Digital Network, physical delivery (postal address), and facsimile. In some cases,

such as E-mail, the entry will have some additional information, such as types of information that the user's equipment can handle."

The X.500 standard enables users to implement a distributed global directory (the specification doesn't mention any time frame for this to take place or address its feasibility, of course, and both are points of controversy). On the local level, X.500 would enable users in an IBM PROFS environment to look up the E-mail addresses for users within the same company who are using a different system, such as DEC's All-In-1.

X.500 will let users browse through user listings just as if they were looking through a telephone book. It could also

Think of X.500 as a kind of digital directory assistance.

set up a type of Yellow Pages browsing capability based on the type of business or service.

The growth of a global directory would come from major E-mail service vendors and private networks linking their perspective user lists. Jeanne Bracken, Pacific Bell director of message-handling systems, says the standard would create a "basic directory assistance [service] magnified a million times in terms of information you can get."

Where's the Beef?

If X.400 is as grown up and worldly as its supporters claim, why can't you simply log on to an E-mail system and exchange electronic messages with anyone, anywhere, at any time? Good question. The answer has to do with conformity and commerce.

First, no standard exists for testing the conformity of X.400 products, and no public E-mail system is going to allow an untested X.400 product to connect to its backbone without some kind of proof that it won't sabotage the entire system. Some companies, such as Telenet, have insti-

continued

up to Telebit's newest modem.

And here's another big difference. Since the T1000 runs the most popular communications software at the highest possible speeds. You can take full advantage of packages like HyperACCESS, Crosstalk-Fast, MicroPhone II, and Acknowledge.

Just plug us in, and the T1000 will fit right in. No matter what your environment.

Remote management for ease of use.

Here's the final difference. The T1000 offers a host of remote management features. Including remote access, remote configuration and remote diagnostics.

So get the modem that's head and shoulders above the rest. In features and performance. At just the right price. Telebit's new

T1000 Multi-Speed Modem.

Call 1-800-TELEBIT or (415) 969-3800, today.

Or write Telebit at
1345 Shorebird Way, Mountain View, CA 94043-1329.

Fax: (415) 969-8888.

Because no one gets the message through like Telebit.

T1000.



©1988 Telebit Corporation. Telebit is a registered trademark and PEP is a trademark of Telebit Corporation. Other brands or product names are trademarks of their respective holders.

*optional

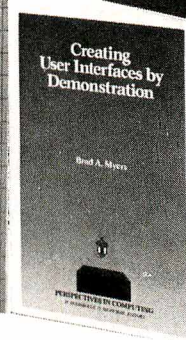
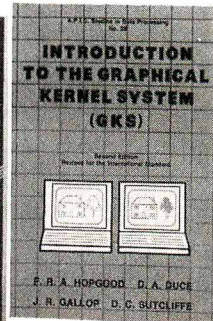
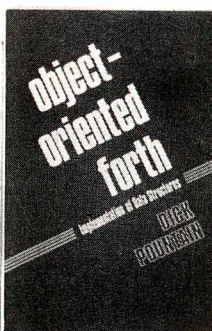
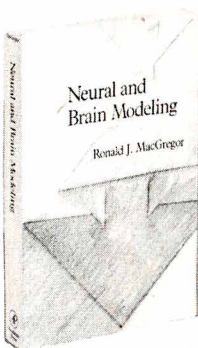
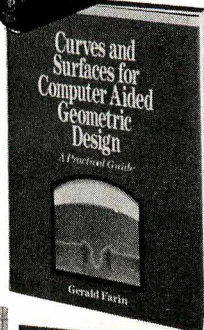
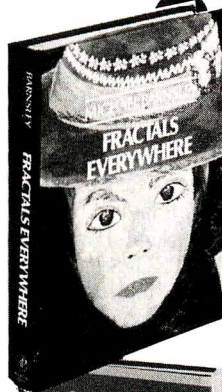
Circle 282 on Reader Service Card



Computer Sciences for the Forward Thinking

Books published by Academic Press

- 1. Fractals Everywhere** by Michael Barnsley. An exciting new area with application to computer graphics and image compression! Illus. 400 pp. \$39.95
- 2. Curves and Surfaces for Computer Aided Geometric Design A Practical Guide** by Gerald Farin. For software developers for CAD/CAM systems, geometric modeling researchers, graphics programmers. 150 diagrams, 352 pp. \$39.95
- 3. Creating User Interfaces by Demonstration** by Brad A. Myers. New for creating interaction techniques...Peridot is fully described as to design, implementation and research. 320 pp. \$29.95
- 4. Object-Oriented Forth Implementation of Advanced Data Structures** edited by Dick Pountain. Makes object-oriented programming available to users of small home computers. 119 pp. \$19.95 paper
- 5. Introduction to the Graphical Kernel System (GKS) 2nd ed.** by Hopgood, Duce, Gallop, Sutcliffe. Highly acclaimed, now with thorough coverage of GKS international standard. 272 pp. \$29.95 paper
- 6. Neural and Brain Modeling** by Ronald J. MacGregor. For researchers & students in neuroscience, computer science, cognitive science, artificial intelligence, bioengineering. 643 pp \$35.00 pap.
- 7. Mathematics for Dynamic Modeling** by Edward Beltrami. Intended for applied math students but the accessible presentation makes it of interest to non-specialists in related fields. 277 pp. \$27.50



tuted proprietary conformity testing procedures. That's fine for vendors targeting their products at Telenet's network. However, Telenet's conformity procedure doesn't apply to any other system, such as Dialcom. This lack of a standardized conformity test will hamper the rapid implementation of X.400 products universally.

The other major issue is that public E-mail networks will not interconnect worldwide until administrative questions, such as billing procedures, are addressed. How will the revenue be split between service providers when a message is sent from the U.S. to the German PTT's system? Should the revenue be split evenly? What if the message from the U.S. consists of a distribution list? If the PTT has to deliver hundreds of copies of a single message sent from the U.S., how does the revenue from that message transfer get fairly distributed across the two commercial systems? Such questions are stumbling blocks to true interconnectivity.

Global Grab Bag

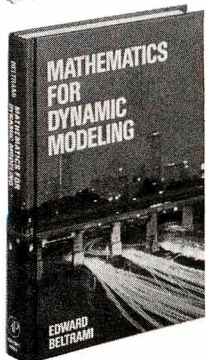
The technology for a ubiquitous E-mail network has been available for years. The standards are now in place. But we may be well into the next decade before anything approaching global connectivity emerges. In the meantime, there will be limited interconnections. And if your corporation needs worldwide messaging, you can certainly pay dearly for it by signing on with one of a few companies, such as Dialcom and Telenet, that provide international E-mail service. Of course, you'll also have to convince your clients to sign on with the same system.

Individual users will have to wait out the corporate suits while they negotiate in high-tech board rooms, and rely on the ARPAnet offspring, if they can stomach the inherent irritations and frustrations associated with such systems. Or they can use the rather limited existing commercial interconnections (MCI Mail and CompuServe) or commercial third-party message "porting" services.

Or they might simply do as the two most powerful offices in the world—the White House and the Kremlin—have done for decades: Use a telex. ■

Brock N. Meeks is a San Diego-based freelance writer who specializes in high technology. You can reach him on BIX as "brock."

Your questions and comments are welcome. Write to: Editor, BYTE, One Phoenix Mill Lane, Peterborough, NH 03458.



McGraw-Hill Bookstore

1221 Avenue of the Americas
New York, New York 10020

MB12

Send me (circle) book # 1 2 3 4 5 6 7

Number of copies _____

Check or credit card: Visa _____ Amer.Exp. _____ Mastercard _____

Account No. _____ Expires _____

Name _____

Address _____

City _____ State _____ Zip _____

Add applicable sales tax, plus \$2.50 postage and handling.



Our Printer Sharing Unit Does Networking!

An Integrated Solution

Take our **Master Switch™**, a sophisticated sharing device, combine it with **MasterNet™** networking software for PCs, and you've got an integrated solution for printer and plotter sharing, file transfer, electronic mail, and a lot more. Of course you can also share modems, minis, and mainframes or access the network remotely. Installation and operation is very simple.

Versatile

Or you can use the Master Switch to link any computer or peripheral with a serial or parallel interface. The switch accepts over 20 commands for controlling the flow of data. It may be operated automatically, by command, or with interactive menus. Its buffer is expandable to one megabyte and holds up to 64 simultaneous jobs. The

MasterLink™ utility diskette for PCs comes with every unit and unleashes the power of the switch with its memory-resident access to the commands and menus.

Other Products

We have a full line of connectivity solutions. If you just want printer sharing, we've got

it. We also have automatic switches, code-activated switches, buffers, converters, cables, protocol converters, multiplexers, line drivers, and other products.

Commitment to Excellence

At Rose Electronics, we're not satisfied until you're satisfied. That's why we have thousands of customers around the world including large, medium, and small businesses, factories, stores, educational institutions, and Federal, state, and local governments. We back our products with full technical support, a one-year warranty, and a thirty-day money-back guarantee.



ROSE
ELECTRONICS

Call now for literature or more information.
(800) 333-9343

Give a Rose to your computer

READER SERVICE

To get further information on the products advertised in BYTE, fill out the reader service card by circling the numbers on the card that correspond to the inquiry number listed with the advertiser. This index is provided as an additional service by the publisher, who assumes no liability for errors or omissions.

* Correspond directly with company.

Index to Advertisers by Product Category

Inquiry No.	Page No.	Inquiry No.	Page No.	Inquiry No.	Page No.	Inquiry No.	Page No.
HARDWARE		INSTRUMENTATION		MONITORS		SOFTWARE SECURITY	
340	ADD INS	343	64 COMPUTER CONTINUUM . . . 372	434 TEAM TECH 96IS-37		353	402 ALADDIN 96IS-18
13 ALPHA PRODUCTS 373		93 DSP DEVELOPMENT CORP. . . 42		282 TELEBIT 150,151		225 PROTECH MARKETING 54	
25 ATI TECHNOLOGIES 50		98 ELEXOR 376		291 TOUCHBASE SYSTEMS INC. . . 20		230 QUA TECH 339	
* BINARY TECH 376		150 JB COMPU-TRONIX 272				233 QUA TECH 339	
37 BLUE CHIP TECHNOLOGY . . . 367		203 ORION 64		347		320 RAINBOW TECH. 18	
63 COMPUTER AGE 385				3	3LYNX 325	240 RAINBOW TECH. 133	
64 COMPUTER CONTINUUM . . . 372		KEYBOARDS/MICE		75 CTX 81			
73 CONTROL VISION 269		133 HOOLEON 102		76 CTX 81			
78 DATA TRANSLATION 233		134 HOOLEON 102		425 PHILIPS PERSONAL MONITORS 96IS-4			
431 FORMOSA 96IS-48		146 ITAC SYSTEMS 116		331 TATUNG 106			
112 GALACTICOMM 59		167 LOGITECH 74,75				354	SYSTEMS
413 GTCO 96IS-17		168 LOGITECH 74,75		348	NETWORK HARDWARE	401 ACER 96IS-34,35	
121 GTEK, INC. 328		169 LOGITECH 95		31 BAY TECHNICAL ASSOCIATES 271		524 ALTEC TECHNOLOGY 96PC-2	
122 GTEK, INC. 328		170 LOGITECH 95		46 BUFFALO 281		20 AMERICAN SEMICONDUCTOR 376	
127 HERCULES 85		252 SCIENCE ACCESSORIES . . . 293		406 CUBIX 96IS-31		* AMPRO 226	
128 HERCULES 85		302 VNS AMERICA 333		407 DATEX 96IS-13		403 APRICOT COMPUTERS . . . 96IS-2,3	
415 INES 96IS-30				M26 GOODWAY MAC51		23 ARCHE TECHNOLOGIES 31	
140 INTEL 56,57		MASS STORAGE		422 MUTEK 96IS-28		24 ARCHE TECHNOLOGIES 31	
432 INTERQUADRAM 96IS-15		10 AK SYSTEMS 362		217 PERSONAL SPACE COMM. . . 364		318 AST RESEARCH 205	
144 IO TECH 367		102 EVEREX 103		245 ROSE ELECTRONICS 153		319 AST RESEARCH 205	
M11 IO TECH MAC59		103 EVEREX 103		278 TAIWAN FIRST LINE CABLE . . 234		325 AST RESEARCH 317	
198 NOHAU CORP. 329		115 GENOA 79		305 WIESEMANN & THEIS 186		326 AST RESEARCH 317	
199 NOHAU CORP. 367		* MAXELL DATA PRODUCTS . . . 7				* AT&T 217	
216 PERISCOPE 303		205 OVERLAND DATA 364		349	POWER SUPPLIES	* AT&T 219	
217 PERSONAL SPACE COMM. . . 364		321 QUALSTAR CORP. 272		209 PARA SYSTEMS 93		* AT&T 221	
433 PHILIPS I & E 96IS-9		274 SYSGEN, INC. 21				32 BEST COMPUTER 206	
228 QUA TECH 339		280 TALLGRASS TECHNOLOGIES . . 43		350	PRINTERS/PLOTTERS	33 BEST COMPUTER 206	
229 QUA TECH 339		281 TALLGRASS TECHNOLOGIES . . 43		7 AEG OLYMPIA 125		55 CLUB AMER. TECH. 28,29	
230 QUA TECH 339				31 BAY TECHNICAL ASSOCIATES 271		* COMPAQ 48A-F	
231 QUA TECH 339		MISCELLANEOUS		48 CAL COMP 109		496 COM-TEK DATA 96MW-5	
232 QUA TECH 339		14 ALPHA PRODUCTS 364		49 CAL COMP 109		506 COM-TEK DATA 96NE-8	
233 QUA TECH 339		* ANTHRO CORP. 26		328 ENTER COMPUTER 102		* DATAWORLD 230	
243 REAL TIME DEVICES 272		M2 APPLIED DATA COMM. MAC12		329 ENTER COMPUTER 102		83 DELL COMPUTERS (INT'L) 158,159	
264 SOTA TECHNOLOGY 165		* AVIS 309		110 FUJITSU AMERICA 22,23		84 DELL COMPUTERS (N.AMER.) 158-161	
279 TALKING TECHNOLOGY 367		31 BAY TECHNICAL ASSOCIATES 271		111 FUJITSU AMERICA 22,23		408 ELONEX 96IS-27	
428 TRIANGLE DIGITAL SERV. 96IS-28				114 GENICOM 61		104 FIVESTAR COMPUTER 8,9	

READER SERVICE

Advertising Supplement included with this issue:
Jameco Electronics (U.S. and Canada Subscribers)

* Correspond directly with company.

Inquiry No.	Page No.	Inquiry No.	Page No.	Inquiry No.	Page No.	Inquiry No.	Page No.
SOFTWARE							
355	APPLE2/MAC APPLICATIONS Business/Office	174	MATHSOFT 69	219	PHAR LAP SOFTWARE 48	487	COMPARE COMPUTERS 96M/AT-3
108	FOX SOFTWARE 25	254	SCIENTIFIC COMPUTER ASSOC. 346	220	POLYTRON 283	488	COMPARE COMPUTERS 96M/AT-3
M19	ODESTA PUBLISHING MAC16	265	SPECTRUM 244	267	STSC 87	494	COMPARE COMPUTERS . 96MW-3
M20	PARAGON CONCEPTS MAC9	266	STATSOFT 197	429	UNICOMAL 96IS-29	495	COMPARE COMPUTERS . 96MW-3
M22	PREFERRED SOFTWARE MAC21	268	STSC 253	296	USERSOFT 279	504	COMPARE COMPUTERS . 96NE-10
M32	APPLE2/MAC APPLICATIONS Scientific/Technical	275	SYSTAT 147	298	VESTRONIX 213	505	COMPARE COMPUTERS . 96NE-10
M1	ALLAN BONADIO ASSOC. MAC60	276	SYSTAT 147	312	ZORTECH 55	59	COMPUCLASSICS 115
M13	MCAE INC. MAC51	358	IBM/MS-DOS APPLICATIONS Miscellaneous	364	IBM/MS-DOS — UTILITIES	62	COMPUSAVE 365
M17	NATIONAL INSTRUMENTS MACCIV	526	JOKER SOFTWARE INT'L . 96PC-1	5	A & L MEIER 347	66	COMPUTER MAIL ORDER . . 38,39
M18	NEURALWARE MAC57	359	IBM/MS-DOS APPLICATIONS /Spreadsheet	26	ATRON 66	67	COMPUTER SURPLUS STORE 376
M33	APPLE2/MAC — CAD	2	1ST CLASS EXPERT SYSTEMS 114	27	AVOCET SYSTEMS, INC. 235	68	COMPUTERLANE 274
M14	MICRO CAD/CAM MAC17	117	GOLDEN BOW 201	36	BLAISE COMPUTING INC. 33	72	CONTECH 370
M25	VAMP, INC. MAC18	360	IBM/MS-DOS — CAD	51	CALIFORNIA S/W PRODUCTS. 376	509	COTTAGE COMPUTERS . . 96NE-4
M34	APPLE2/MAC — LAN	21	AMERICAN SM. BUS. COMP. . 144	52	CALIFORNIA S/W PRODUCTS. 376	481	DALLAS SYSTEMS 96SW-3
M8	DOUGLAS ELECTRONICS MACCIII	333	GENERIC SOFTWARE 310	507	COPY TECHNOLOGIES . . 96NE-13	88	DISC INTERNATIONAL 368
M35	APPLE2/MAC — LANGUAGES	334	GENERIC SOFTWARE 310	508	COPY TECHNOLOGIES . . 96NE-13	89	DISK COTECH 362
M3	COMPUTABLE FUNCTIONS, INC. MAC37	306	WINTEK CORP. 5	80	DAYSTAR COMPUTING 53	90	DISKETTE CONNECTION . . . 367
M9	D.C.M. DATA PROD. MAC22	307	WINTEK CORP. 362	81	DAYSTAR COMPUTING 53	91	DISKS TO GO 364
M6	DIGITAL MAC54,55	361	IBM/MSDOS — LAN	82	DAYTRON 342	95	DYNAMIC ELECTRONICS . . . 376
M7	DIGITAL MAC54,55	523	3-F 96PC-5	85	DEPARTMENTAL TECH., INC. . 239	96	DYNAMIC ELECTRONICS . . . 376
356	IBM/MS-DOS APPLICATIONS Business/Office	43	BORLAND 71	117	GOLDEN BOW 201	512	ELECTRIFIED DISC. 96NE-1
2	1ST CLASS EXPERT SYSTEMS 114	44	BORLAND 71	330	GOLDEN BOW 362	M10	ERGOTRON MAC3
283	BROWN BAG 251	335	SANTA CRUZ OPERATION . . . 175	123	HAMMERLY COMP. SERV. . . . 73	107	FOUR GUYS COMPUTERS . . . 58
284	BROWN BAG 263	336	SANTA CRUZ OPERATION . . . 175	132	HITECH EQUIP. CORP. 342	482	GENERAL BUSINESS MACH. 96SW-1
109	FTG DATA 368	258	SIMPLE NET SYSTEMS 148	155	KADAK 362	411	GREY MATTER 96IS-42
410	GAMMA PRODUCTION . . . 96IS-22	259	SIMPLE NET SYSTEMS 148	175	MATRIX 266	124	HARD DISK DRIVES INT'L . . 340
416	INK INTERNATIONAL 96IS-16	362	IBM/MS-DOS — GRAPHICS	194	MIX SOFTWARE 139	125	HARD DISK DRIVES INT'L . . 340
188	MICRORIM 82,83	53	CANON USA, INC. 89	219	PHAR LAP SOFTWARE 48	136	IC EXPRESS 362
189	MICRORIM 82,83	82	DAYTRON 342	227	PUBLISHING TECHNOLOGIES 134	138	IMPACT 54
423	NOVELL 96IS-11	315	EASTMAN KODAK 256C	529	SAK TECHNOLOGY 96PC-3	147	JADE 375
*	ORACLE 77	*	GRAPHICS SOFTWARE SYS. . 214	250	SAX SOFTWARE 311	148	JAMECO 360,361
210	PARSONS TECHNOLOGY . . . 45	293	TRILOBYTE 385	262	SOFTWARE MASTERS 119	514	JASMINE COMP. SYS. 96NE-15
211	PATTON & PATTON 318	363	IBM/MS-DOS — LANGUAGES	272	SUPERSOFT 104	153	J.D.R. MICRODEVICES . . . 380,381
237	QUICKSOFT 32	4	A & L MEIER 345	*	VERMONT CREATIVE S/W . . . 10	154	J.D.R. MICRODEVICES . . . 382-384
*	RAIMA 35	8	AETECH 100	308	WOODCHUCK IND. 258	*	J.D.R. MICRODEVICES . . . 393-408
*	SCITOR CORP. 225	9	AETECH 100	365	IBM/MS-DOS COMMUNICATIONS	527	KNAPCO 96PC-6
260	SMALL COMPUTER CO., INC. 143	39	BORLAND CII	92	DIVERSIFIED COMP. SYS. . . . 368	477	KNAPCO 96SE-1
357	IBM/MS-DOS APPLICATIONS Scientific/Technical	40	BORLAND CII	119	GRAFFPOINT 258	528	MASTER PROGRAMMERS, INC. 96PC-12
6	ACCEL TECH 385	41	BORLAND 1	156	KEA SYSTEMS 128	178	MEAD COMPUTER 369
34	BINARY ENGINEERING 166	42	BORLAND 1	157	KEA SYSTEMS 269	179	MEGASOFT 370
97	ECOSOFT 167	405	CALEND 96IS-23	208	PALLADIAN TECH. 376	180	MEGASOFT 370
409	FLEMING SOFTWARE 96IS-32	56	CNS, INC. 250	261	SOFTRONICS 346	421	MICRO U.S. 96IS-30
123	HAMMERLY 73	57	CNS, INC. 250	292	TRAVELING SOFTWARE 295	185	MICROCOM SYSTEMS 24
135	HORSTMANN 212	99	ELLIS COMPUTING INC. 126	366	OTHER — CROSS DEVELOPMENT	*	MICROCOMP. MKTG. COUNCIL . MAC62
419	LOGIC PROGRAMMING ASSOC. 96IS-20	412	GSE 96IS-39	*	SOFTWARE DEV. SYS. 99	*	MICROCOMPUTER MKTG.CNCL 96IS-44
		123	HAMMERLY 73	503	3-F 96PC-5	*	MICROCOMPUTER MKTG.CNCL 96NE-9
		151	JENSEN & PARTNERS 129	28	ADVANCED COMP. PROD. 378,379	*	MICROCOMPUTER MKTG.CNCL 96SE-3
		161	LAHEY COMPUTER SYS. INC. 128	15	ALTEX ELECTRONICS 366	187	MICROPROCESSORS UNLTD. 364
		173	MANX SOFTWARE SYSTEMS . 135	19	AMERICAN RIBBON 168	*	MICROWAY 227
		*	MICROSOFT 13-15	29	B & B ELECTRONICS 367	193	MICROWAY 313
		*	MICROSOFT 32A-H	38	BOFFIN LTD. 306	195	MONTGOMERY GRANT 289
		*	MICROSOFT 210,211	*	BUYER'S MART 349-359	196	M.H.I. 363
				*	CALIFORNIA DIGITAL 377	*	NAT'L COMP. ACCESSORIES 374
				50	CALIFORNIA FREWARE 196	215	ONLINE STORE 179
				58	COMPACT DISK PROD., INC. . . 60	206	PACIFIC COMPUTER 365

* Correspond directly with company.

Available 24 Hours,
7 Days a Week

392 B Y T E • DECEMBER 1988

Macintosh Supplement Free Information

To receive free information on Macintosh products and advertisers in this special supplement, just follow steps 1, 2 and 3.

1

Circle numbers on reply card which correspond to numbers assigned to items of interest to you.

2

Check all the appropriate answers to questions "A" through "F".

3

Print your name and address and mail.

Circle for FREE INFORMATION

M1 M2 M3 M4 M5 M6 M7
M8 M9 M10 M11 M12 M13 M14
M15 M16 M17 M18 M19 M20 M21
M22 M23 M24 M25 M26 M27 M28
M29 M30 M31 M32 M33 M34 M35
M36 M37 M38 M39 M40 M41 M42
M43 M44 M45 M46 M47 M48 M49
M50 M51 M52 M53 M54 M55 M56
M57 M58 M59 M60 M61 M62 M63
M64 M65 M66 M67 M68 M69 M70
M71 M72 M73 M74 M75 M76 M77

M78 M79 M80 M81 M82 M83 M84
M85 M86 M87 M88 M89 M90 M91
M92 M93 M94 M95 M96 M97 M98
M99 M100 M101 M102 M103 M104 M105
M106 M107 M108 M109 M110 M111 M112
M113 M114 M115 M116 M117 M118 M119
M120 M121 M122 M123 M124 M125 M126
M127 M128 M129 M130 M131 M132 M133
M134 M135 M136 M137 M138 M139 M140
M141 M142 M143 M144 M145 M146 M147
M148 M149 M150 M151 M152 M153 M154

M155 M156 M157 M158 M159 M160 M161
M162 M163 M164 M165 M166 M167 M168
M169 M170 M171 M172 M173 M174 M175
M176 M177 M178 M179 M180 M181 M182
M183 M184 M185 M186 M187 M188 M189
M190 M191 M192 M193 M194 M195 M196
M197 M198 M199 M200 M201 M202 M203
M204 M205 M206 M207 M208 M209 M210
M211 M212 M213 M214 M215 M216 M217
M218 M219 M220 M221 M222 M223 M224
M225 M226 M227 M228 M229 M230 M231

M232 M233 M234 M235 M236 M237 M238
M239 M240 M241 M242 M243 M244 M245
M246 M247 M248 M249 M250 M251 M252
M253 M254 M255 M256 M257 M258 M259
M260 M261 M262 M263 M264 M265 M266
M267 M268 M269 M270 M271 M272 M273
M274 M275 M276 M277 M278 M279 M280
M281 M282 M283 M284 M285 M286 M287
M288 M289 M290 M291 M292 M293 M294
M295 M296 M297 M298 M299

12MAC2

Fill out this coupon carefully. PLEASE PRINT. Requests cannot be honored unless the zip code is included. Supplement inquiries cannot be requested via TIPS. This card is valid for 6 months from cover date.

A. Do you have management responsibilities within your company?

- ☐ 1 Senior-level management
☐ 2 Other management
☐ 3 Non-management

B. Reason for request: (Check all that apply.)

- ☐ 1 Business use for yourself
☐ 2 Business use for your company
☐ 3 Personal use

C. For how many Macintosh personal computers do you currently buy, specify or approve brands of products?

- ☐ 1 10 or less
☐ 2 11-25
☐ 3 26-99
☐ 4 100 or more

D. For how many Macintosh personal computers will you buy, specify or approve brands of products within the next two years?

- ☐ 1 10 or less
☐ 2 11-25
☐ 3 26-99
☐ 4 100 or more

E. In total, how many Macintosh personal computers is your entire organization considering for purchase within the next two years?

- ☐ 1 10 or less
☐ 2 11-25
☐ 3 26-99
☐ 4 100-499
☐ 5 500 or more

F. What type of personal computer do you primarily use?

- ☐ 1 IBM AT or 80286-based compatible
☐ 2 Compaq 386 or 80386-based compatible
☐ 3 IBM PS/2 (with Micro-Channel) or compatible
☐ 4 Apple Mac (except Mac II)
☐ 5 Apple Mac II
☐ 6 Other

Name _____
Title _____ Business Phone (____) _____
Company _____
Address _____
City _____ State _____ Zip _____



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 176 PITTSFIELD, MA

POSTAGE WILL BE PAID BY ADDRESSEE

BYTE

READER SERVICE
PO Box 5110
Pittsfield, MA 01203-9926
USA

Macintosh Supplement Free Information

To receive free information on Macintosh products and advertisers in this special supplement, just follow steps 1, 2 and 3.

1

Circle numbers on reply card which correspond to numbers assigned to items of interest to you.

2

Check all the appropriate answers to questions "A" through "F".

3

Print your name and address and mail.



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 176 PITTSFIELD, MA

POSTAGE WILL BE PAID BY ADDRESSEE

BYTE

READER SERVICE
PO Box 5110
Pittsfield, MA 01203-9926
USA

Circle for FREE INFORMATION

M1 M2 M3 M4 M5 M6 M7
M8 M9 M10 M11 M12 M13 M14
M15 M16 M17 M18 M19 M20 M21
M22 M23 M24 M25 M26 M27 M28
M29 M30 M31 M32 M33 M34 M35
M36 M37 M38 M39 M40 M41 M42
M43 M44 M45 M46 M47 M48 M49
M50 M51 M52 M53 M54 M55 M56
M57 M58 M59 M60 M61 M62 M63
M64 M65 M66 M67 M68 M69 M70
M71 M72 M73 M74 M75 M76 M77

M78 M79 M80 M81 M82 M83 M84
M85 M86 M87 M88 M89 M90 M91
M92 M93 M94 M95 M96 M97 M98
M99 M100 M101 M102 M103 M104 M105
M106 M107 M108 M109 M110 M111 M112
M113 M114 M115 M116 M117 M118 M119
M120 M121 M122 M123 M124 M125 M126
M127 M128 M129 M130 M131 M132 M133
M134 M135 M136 M137 M138 M139 M140
M141 M142 M143 M144 M145 M146 M147
M148 M149 M150 M151 M152 M153 M154

M155 M156 M157 M158 M159 M160 M161
M162 M163 M164 M165 M166 M167 M168
M169 M170 M171 M172 M173 M174 M175
M176 M177 M178 M179 M180 M181 M182
M183 M184 M185 M186 M187 M188 M189
M190 M191 M192 M193 M194 M195 M196
M197 M198 M199 M200 M201 M202 M203
M204 M205 M206 M207 M208 M209 M210
M211 M212 M213 M214 M215 M216 M217
M218 M219 M220 M221 M222 M223 M224
M225 M226 M227 M228 M229 M230 M231

M232 M233 M234 M235 M236 M237 M238
M239 M240 M241 M242 M243 M244 M245
M246 M247 M248 M249 M250 M251 M252
M253 M254 M255 M256 M257 M258 M259
M260 M261 M262 M263 M264 M265 M266
M267 M268 M269 M270 M271 M272 M273
M274 M275 M276 M277 M278 M279 M280
M281 M282 M283 M284 M285 M286 M287
M288 M289 M290 M291 M292 M293 M294
M295 M296 M297 M298 M299

12MAC2

Fill out this coupon carefully. PLEASE PRINT. Requests cannot be honored unless the zip code is included. Supplement inquiries cannot be requested via TIPS. This card is valid for 6 months from cover date.

A. Do you have management responsibilities within your company?

- 1 ☐ Senior-level management
2 ☐ Other management
3 ☐ Non-management

B. Reason for request: (Check all that apply.)

- 1 ☐ Business use for yourself
2 ☐ Business use for your company
3 ☐ Personal use

C. For how many Macintosh personal computers do you currently buy, specify or approve brands of products?

- 1 ☐ 10 or less
2 ☐ 11-25
3 ☐ 26-99
4 ☐ 100 or more

D. For how many Macintosh personal computers will you buy, specify or approve brands of products within the next two years?

- 1 ☐ 10 or less
2 ☐ 11-25
3 ☐ 26-99
4 ☐ 100 or more

E. In total, how many Macintosh personal computers is your entire organization considering for purchase within the next two years?

- 1 ☐ 10 or less
2 ☐ 11-25
3 ☐ 26-99
4 ☐ 100-499
5 ☐ 500 or more

F. What type of personal computer do you primarily use?

- 1 ☐ IBM AT or 80286-based compatible
2 ☐ Compaq 386 or 80386-based compatible
3 ☐ IBM PS/2 (with Micro-Channel) or compatible
4 ☐ Apple Mac (except Mac II)
5 ☐ Apple Mac II
6 ☐ Other

Name _____

Title _____ Business Phone (____) _____

Company _____

Address _____

City _____ State _____ Zip _____

FREE INFORMATION

Want More Information About the Products and Advertisers Featured in this Issue?

1

Circle numbers on reply card which correspond to numbers assigned to items of interest to you.

2

Check all the appropriate answers to questions "A" through "C".

3

Print your name and address and mail.

Fill out this coupon carefully. PLEASE PRINT.

Name _____

Title _____ (_____) Phone _____

Company _____

Address _____

City _____ State _____ Zip _____

A. What is your level of management responsibility?

- ☐ 1 Senior-level Management
☐ 2 Other Management
☐ 3 Non-Management

B. What is your primary job function/principal area of responsibility? (Check one.)

- ☐ 1 Administration
☐ 2 Accounting/Finance
☐ 3 MIS/DP/Information Center
☐ 4 Product Design and Development
☐ 5 Research and Development
☐ 6 Manufacturing
☐ 7 Sales/Marketing
☐ 8 Purchasing
☐ 9 Personnel
☐ 10 Education/Training
☐ 11 Other: _____

C. Please indicate your organization's primary business activity: (Check one.)

- ☐ 1 Computer-Related Businesses:
☐ 1 Manufacturer (Hardware, Software)

- ☐ 2 Computer Retail Stores
☐ 3 Consultants
☐ 4 Service Bureau/Planning
☐ 5 Distributor/Wholesaler
☐ 6 Systems House/
Integrator/VAR
☐ 7 Other: _____

Non-Computer-Related Businesses:

- ☐ 8 Manufacturing
☐ 9 Finance, Insurance,
Real Estate
☐ 10 Retail/Wholesale
☐ 11 Education
☐ 12 Government
☐ 13 Military
☐ 14 Professions (Law,
Medicine, Engineering,
Architecture)
☐ 15 Consulting
☐ 16 Other Business Services
☐ 17 Transportation,
Communications, Utilities
☐ 18 Other: _____

DECEMBER
48CRSU

☐ Please send me one year of BYTE Magazine for \$22.95 and bill me. Offer valid in U.S. and possessions only.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510
511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570
571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600
601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630
631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690
691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810
811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840
841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870
871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930
931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960
961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990
991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020
1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050
1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080
1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110
1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140
1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170
1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS MAIL PERMIT NO. 176 PITTSFIELD, MA

POSTAGE WILL BE PAID BY ADDRESSEE

BYTE

READER SERVICE
PO Box 5110
Pittsfield, MA 01203-9926
USA



FREE INFORMATION

Want More Information About the Products and Advertisers Featured in this Issue?

1

Circle numbers on reply card which correspond to numbers assigned to items of interest to you.

2

Check all the appropriate answers to questions "A" through "C".

3

Print your name and address and mail.



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 176 PITTSFIELD, MA

POSTAGE WILL BE PAID BY ADDRESSEE

BYTE

READER SERVICE

PO Box 5110

Pittsfield, MA 01203-9926

USA



Fill out this coupon carefully. PLEASE PRINT.

Name _____

Title _____ Phone _____

Company _____

Address _____

City _____ State _____ Zip _____

A. What is your level of management responsibility?

- ☐ Senior-level Management
☐ Other Management
☐ Non-Management

B. What is your primary job function/principal area of responsibility? (Check one.)

- ☐ Administration
☐ Accounting/Finance
☐ MIS/DP/Information Center
☐ Product Design and Development
☐ Research and Development
☐ Manufacturing
☐ Sales/Marketing
☐ Purchasing
☐ Personnel
☐ Education/Training
☐ Other: _____

C. Please indicate your organization's primary business activity: (Check one.)

- ☐ Computer-Related Businesses:
☐ Manufacturer (Hardware, Software)

☐ Computer Retail Stores

☐ Consultants

☐ Service Bureau/Planning

☐ Distributor/Wholesaler

☐ Systems House/Integrator/VAR

☐ Other: _____

Non-Computer-Related Businesses:

☐ Manufacturing

☐ Finance, Insurance, Real Estate

☐ Retail/Wholesale

☐ Education

☐ Government

☐ Military

☐ Professions (Law, Medicine, Engineering, Architecture)

☐ Consulting

☐ Other Business Services

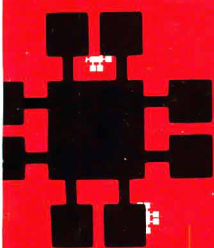
☐ Transportation, Communications, Utilities

☐ Other: _____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510
511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570
571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600
601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630
631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690
691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810
811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840
841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870
871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930
931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960
961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990
991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020
1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050
1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080
1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110
1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140
1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170
1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200

DECEMBER
48CRSU

☐ Please send me one year of BYTE Magazine for \$22.95 and bill me. Offer valid in U.S. and possessions only.



JDR Microdevices®



Price breakthrough!

**1.44 Mb
Drive
\$99⁹⁵**

JDR Microdevices®

Happy Holidays from JDR!

All of us at JDR Microdevices wish you and your family a happy holiday season and a healthy 1989!

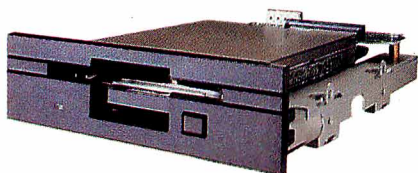
To make your holiday shopping a little easier, we've put together this "wish book" of JDR gift ideas for the computer enthusiast. Just call us toll-free by December 19th, and we'll **guarantee delivery** of in-stock items by Christmas!

See some items that you'd really like? Just tear out the page and put it where your someone special will find it (after all, you don't really want another tie, do you?). You will be pleased to know that every item JDR sells is backed by the industry's finest guarantees and an organization dedicated to 100% customer satisfaction.

And, when you buy from JDR, you can buy with confidence because all of our products are supported with these services:

- 1 year limited warranty on all products*
- 30 day money back guarantee*
- Toll-free customer service
- Toll-free technical support
- Most orders shipped within 24 hours
- No credit card surcharge

from our cover: 1.44 Mb 3-1/2" floppy drive



Join the 3-1/2" revolution for under \$100! With a format capacity of 1.44 Mb, this high density drive doubles the capacity of older 3-1/2" drives (720K) and holds 17% more data than 5-1/4" high density drives in a smaller, more convenient diskette. For added flexibility the drive also works with 720K floppy disks. Optional software driver available for some versions of BIOS that do not support 1.44 Mb drives (requires MS-DOS 3.2 or above).

FDD-1.44X (Black)	\$99.95
FDD-1.44A (Beige)	\$99.95
FDD-1.44 SOFT Software driver	\$19.95

3 1/2" Nashua Diskettes

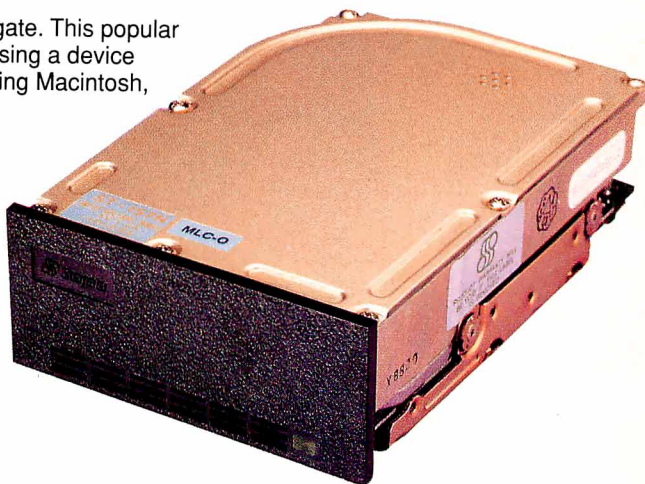
A great stocking stuffer - everyone needs more diskettes. These high quality Nashua diskettes protect valuable data for a lifetime. Sold in boxes of 10.

N-3.5DS	720K Double Sided/Double Density	\$16.95
N-3.5HD	1.44 Mb Double Sided/High Density	\$49.95

Seagate SCSI hard disk drives

Choose from the full line of embedded SCSI drives from Seagate. This popular standard offers speed, expandability and the advantages of using a device independent bus. Compatible with a variety of systems including Macintosh, Tandy and Amiga.

Size	Model #	Mb	Avg. Speed	Price
3-1/2"	ST-125N	21.5	40MS	\$399
3-1/2"	ST-138N	32.2	40MS	\$399
3-1/2"	ST-157N	48.6	40MS	\$499
5-1/4"	ST-225N	21.3	65MS	\$349
5-1/4"	ST-251N	43.1	40MS	\$449
5-1/4"	ST-277N	64.9	40MS	\$549
5-1/4"	ST-296N	85.0	28MS	\$995



* A full copy of our policy is available on request

TERMS: Minimum order \$10.00. For shipping and handling include \$2.50 for UPS Ground and \$3.50 for UPS Air. Orders over 1 lb. and foreign orders may require additional shipping charges - please contact the sales department for the amount. CA. residents must include applicable sales tax. Prices are subject to change without notice. We are not responsible for typographical errors. We reserve the right to limit quantities and to substitute manufacturer. All merchandise subject to prior sale. A full copy of our terms is available upon request. Items pictured may only be representative.

Hard disks

Seagate hard disk drives are renowned for their quality and reliability. Our hard disk kits come complete with controller, cables and all mounting hardware. Installation is easy with the step-by-step instructions that lead you through mounting, formatting and partitioning.

 **Seagate**

20 MB Kit \$269

30 Mb Kit \$299



buy a controller with a hard disk for extra savings!

Size	Model #	Size	Avg. Speed	Drive Alone	Packaged with MCT Controller			
					MCT-HDC	MCT-RLL	MCT-AFH	MCT-AFH-RLL
20Mb	ST-125	3-1/2"	40MS	\$259	\$303	----	\$373	----
30MbRLL	ST-138	3-1/2"	40MS	\$289	----	\$339	----	\$429
20Mb	ST-225	5-1/4"	65MS	\$225	\$269	----	\$339	----
30Mb RLL	ST-238	5-1/4"	65MS	\$249	----	\$299	----	\$389
40Mb	ST-251	5-1/4"	40MS	\$379	\$419	----	\$489	----
40Mb	ST-251-1	5-1/4"	28MS	\$469	\$509	----	\$579	----
60Mb RLL	ST-277	5-1/4"	40MS	\$449	----	\$499	----	\$589
80Mb	ST-4096	5-1/4"	28MS	\$629	----	----	\$739	----

Floppy/hard controller

This 16-bit controller card for AT compatible computers supports up to two floppy drives (5-1/4" or 3-1/2" floppy, 360K, 720K, 1.2Mb or 1.44Mb) and two hard disks. It has a high speed (16 bit) bus to take advantage of the fast 80286 microprocessor. Includes support for disk activity LEDs.

MCT-AFH \$149.95

Floppy/hard RLL

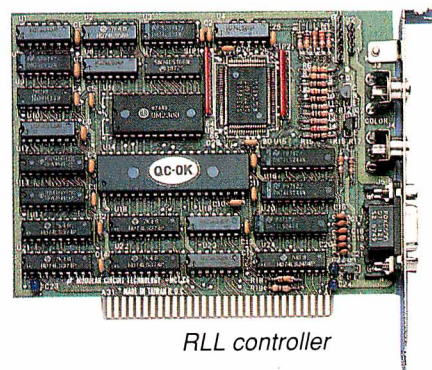
Increase hard disk performance and free up an expansion slot at the same time! This controller card combines functions normally requiring two expansion cards. Supports up to two RLL hard drives (such as the ST-238 or ST-277) for better hard disk performance, and two floppy drives (5-1/4" or 3-1/2" floppy, 360K, 720K, 1.2Mb or 1.44Mb). Its non-interleaved operation provides faster controller/hard drive performance. Designed for AT compatibles.

MCT-AFH-RLL \$199.95

Hard disk controller

This versatile hard disk controller will support just about any hard disk you wish to install. It will work with 5, 10, 20, 30 and 40 megabyte drives. Designed for XT compatibles.

MCT-HDC \$79.95



RLL controller

RLL controller

Transfer data 50% faster! This RLL controller records and retrieves hard disk data much faster than ordinary hard disk controllers. Supports up to two RLL hard disk drives (such as the ST-238 or ST-277). Designed for XT compatibles.

MCT-RLL \$119.95

COPYRIGHT 1988 JDR MICRODEVICES

JDR Microdevices and the JDR Microdevices logo are registered trademarks of JDR Microdevices. IBM, AT, PS/2 are trademarks of International Business Machines.

Order Toll Free: 800-538-5000 LOCAL (408) 866-6200
FAX (408) 378-8927

Build your own system

JDR has sold over 25,000 systems to thousands of satisfied customers. We're the leader in build-your-own systems because we provide all the support you need to be quickly up and running. All you need is a screwdriver! In less than two hours, you can easily build a fully functional, IBM compatible computer, and you'll also have gained a fundamental understanding of your computer's architecture. Our tutorial video and our PC software allow you to get the most out of your new computer almost immediately. If you're new to computing, and you intend to become proficient, this is a great way to start!

Before adding an item to our product line we perform rigorous tests for compatibility and performance, plus we provide clear, understandable and detailed documentation and **toll-free** technical support.

Here are just two examples of our most popular configurations:

"Yesterday I spoke with a wonderful woman named Jill and I wanted to let you know how much I appreciated her help. I called your company knowing little to nothing about computer parts etc., and Jill was absolutely magnificent! I'd like to thank her for all the help, patience and wonderful knowledge that she gave me."

Louise Morley,
Fort Lauderdale, FL

Business system

Mini 286 12 Mhz motherboard	MCT-M286-12	\$399.95
640K RAM memory	18 x 41256-120	233.10
	18 x 4164-120	57.42
Flip-top case and power supply	CASE-JR	149.95
Samsung monochrome monitor	MONO-SAMSUNG	129.95
Enhanced 101-key keyboard	BTC-5339	79.95
Fujitsu 1.2 Mb 5-1/4" drive	M2553K	119.95
3-1/2" 1.44 Mb drive	FDD-1.44A	99.95
20 Mb Seagate Hard drive	ST-225	339.00
Floppy/hard controller	MCT-AFH	
Monochrome graphics adaptor	MCT-MGP	59.95
Complete system (Unassembled)		\$1769.17



Basic starter system

Standard 8088 motherboard	MCT-XMB	\$87.95
256K RAM memory	9 x 41256-150	112.05
135 watt power supply	PS-135	59.95
Flip-top case	CASE -FLIP	34.95
Monochrome monitor	HM-1210	69.95
Standard keyboard	BTC-5060	59.95
360K floppy disk drive	FDD-360	69.95
Floppy drive controller	MCT-FDC	29.95
Monochrome graphics adaptor	MCT-MGP	59.95
Complete system (Unassembled)		\$584.65

Visit our retail store:

1256 S. BASCOM AVE, SAN JOSE, CA
(408) 947-8881 M-F 9-7, SAT 9-5, SUN 12-4

PC software

With any purchase over \$100 you are entitled to a copy of one of these popular 'Shareware' programs.

Baker's Dozen - Does nearly everything! Disk utilities, calendar, mini-spreadsheet and more!

PC Dial - A full featured communications program for your modem!

PC Tickle/XD Extended DOS - Automatically helps you keep appointments. Includes extra DOS utilities.

PC File+ - Faster than most databases and easier to learn.

PC Calc - A "business-strength" spreadsheet that's suitable for home or office.

PC Type/PC Style - This all-purpose word processor includes a spelling and style checker.



"Shareware" is software based on the honor system. Try the program out at your own pace. If you continue to use the program you pay the manufacturer and become a registered user. These programs are from "Buttonware", a leading publisher of shareware.

Video assembly tutor

Only \$4.95 when purchased with a motherboard, \$19.95 when purchased separately. JDR's video tutor makes building your XT compatible even easier. This easy-to-follow video walks you through assembly, from memory installation to final system testing. This videocassette helps you learn about your computer as you build it! VHS or Beta formats available.

JDR-VHS	\$4.95 with motherboard	\$19.95 alone
JDR-BETA	\$4.95 with motherboard	\$19.95 alone

PC educational video

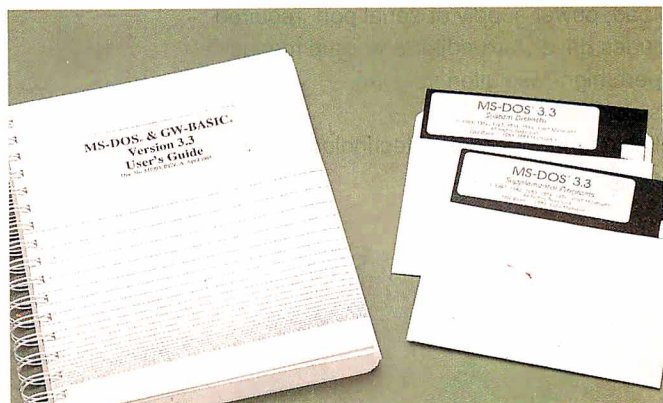
Learn about your computer the easy way! Discover more about the internal workings of your computer's operations with this easy-to-follow video. The 90 minute video presentation covers internal/external components, the video display system, input and output, storage devices and common DOS commands. You'll also learn some powerful DOS commands using a walk-through tutorial diskette.

DOS-VIDEO **\$79.95**

MS-DOS 3.3

MS-DOS is the industry standard operating system that you'll need to run most software. DOS 3.3 supports the latest high-density 3.5" drives (see our cover) and 17 new commands for quicker, more efficient computing. The extensive, well-written manual helps you to get the most out of this time-proven DOS.

MS-DOS **\$79.95**



Order Toll Free: 800-538-5000 **LOCAL (408) 866-6200**
FAX (408) 378-8927

Desktop publishing



Handy Scanner

This hand-held scanner is more cost effective than flatbed scanners and is also much easier to use. Just roll the Handy Scanner over the image you want displayed on the screen—it's that simple! The DFI Scanner HS-3000 scans images up to 4.1" wide with a maximum resolution of 400 DPI and is ideal for desktop publishing.

- User selectable 100, 200, 300 or 400 DPI in both directions
- 2 encoding methods: B&W (High contrast) & half-tone (3 modes)
- 32 levels of gray scale
- User adjustable brightness control
- Hercules, CGA & EGA compatible
- Image editor utility permits 90° rotation & the ability to save in Windows, GEM, Halo & PC Paintbrush formats
- Includes bus interface card, no serial port required
- Includes Halo DPE, a sophisticated Desktop Publishing Editor
- Complete documentation
- Attractive case for manuals and software

HS-3000

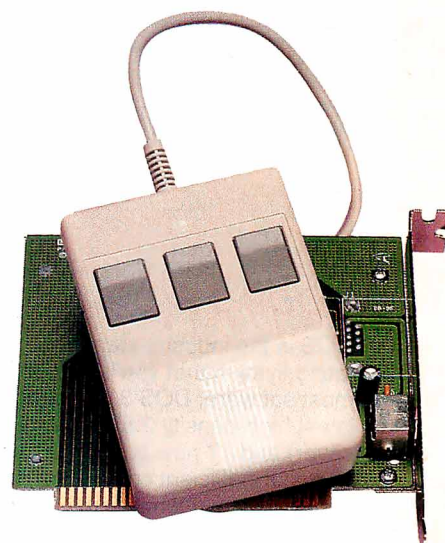
\$249.95

Logitech Hirez mouse

An incredibly responsive bus mouse for those who want the very best! This high resolution (320 dpi) mouse is ideal for desktop publishing and CAD programs. Requires less desk space to use.

- 320 dots-per-inch resolution
- No pad, power supply or serial port required
- Includes driver, text editor & pop-up menus
- Superb high-resolution tracking
- Bus card included
- Reliable opto-mechanical technology

LMOUSE-BH \$99.95



Logitech Hirez mouse

2-button mouse

An inexpensive but very capable mouse for the occasional mouse user.

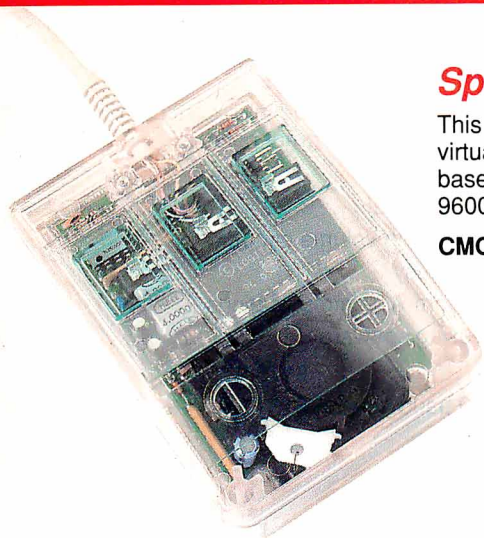
- Device driver software included
- Connects to standard serial port
- Reliable, accurate opto-mechanical design

LMOUSE-2

\$49.95

 LOGITECH

Logitech - editors' choice!



Special Edition: see-through mouse

This serial mouse is clearly a conversation piece and more! It's compatible with virtually all mouse-based programs, and programmable to adapt any keyboard based application. High resolution, adjustable cursor control. Programmable 9600 baud rate. Includes LOGIPAIN and a 9 to 25 pin adaptor.

CMOUSE-P \$109.95

Logitech 3-button mouse

Our best selling mouse! Voted PC Magazine's "Editor's Choice" and now the standard in the industry. This all-purpose opto-mechanical mouse is fully compatible with with most any software that supports a mouse. All versions support the following features:

- Serial support (COM1/COM2)
- Lotus 1-2-3 compatible with software shell.
- 200 dots per inch resolution
- "Click" software adjusts programs for mouse use automatically
- "Logimenu" adapts keyboard-only applications for mouse use with pop-up menus
- "Point Editor"—an easy-to-use mouse-based editor

LMOUSE \$79.95

Serial mouse with Logipaint

Includes LOGIPAIN — a powerful and versatile painting program.

LMOUSE-P \$99.95

**FREE WATCH!
WITH PURCHASE**

Bus mouse with Logipaint

Includes bus interface card and LOGIPAIN. No serial port required.

LMOUSE-BP \$99.95

**FREE WATCH!
WITH PURCHASE**

Bus mouse with Logipaint/CAD

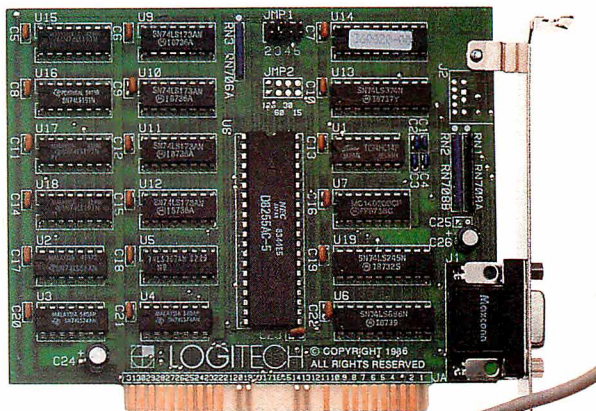
Everything you need to turn your PC into a full CAD workstation. Includes Generic Cad 3.0 with dot plot.

LMOUSE-BPC \$149.95

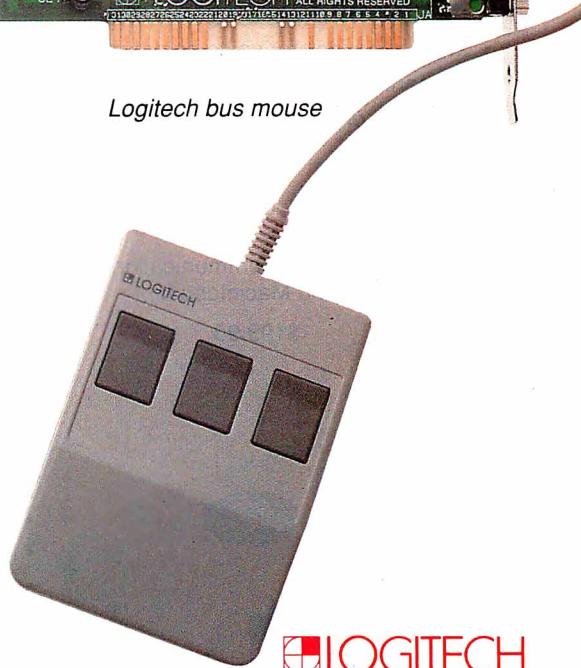
Logitech publisher mouse

Complete desktop publishing package includes 3 button mouse, bus interface card and Publisher software, a sophisticated page layout program.

LMOUSE-BPBL \$139.95



Logitech bus mouse



LOGITECH



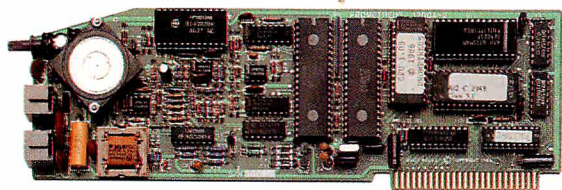
Free gift with purchase! Logitech watch!

We'll send you this attractive watch as an extra gift when you purchase either the Serial mouse with Logipaint or the Bus mouse with Logipaint — two of our most popular packages.

Order Toll Free: 800-538-5000

**LOCAL (408) 866-6200
FAX (408) 378-8927**

Modems



Internal modems for Apple II

An internal 2400/1200/300 baud intelligent card modem for the Apple II family, now at a great price!

- Hayes compatible
- Auto answer/auto dial
- Built-in speaker with volume control
- Auto redial on busy
- Includes ProCom-A Communications & Word Processing software

PRO-24A **\$179.95**

PRO-12A 1200 baud version **\$139.95**

2400 baud external modem

A 2400/1200/300 baud Hayes compatible modem packed with features you'd expect to find only in higher priced models. An excellent value!

- 8 easy-to-read status LED's
- Adjustable volume control
- Call progress monitoring
- 2nd phone jack for voice communications
- Comprehensive user documentation
- Requires one serial port & cable (optional)

PRO-24E **\$169.95**



Macintosh 2400 baud external modem

Includes ProCom-M communications software and cable for Mac Plus, Macintosh SE and Macintosh II.

PRO-24EM **\$199.95**



Call home from anywhere with the pocket modem

This take-everywhere modem is great for laptops and portables and has all the power you'd expect from a full size model. Now wherever you are, you're just a phone call away from your data. Quality design in a small package.

- Operates off one 9 volt battery (included)
- AC power pack & phone line cord included
- Switchable Bell/International protocol
- Serial interface (DB25 connector)
- 1200/300 baud operation
- 4 status indicators
- Weighs only 6 ounces

PRO-12P **\$99.95**

Call our 24-hour BBS
(408) 374-2171

For technical support,
conferencing, tips and
more

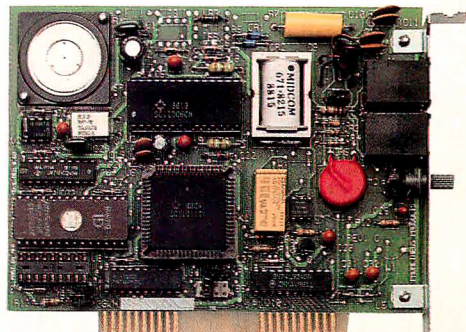
Hayes compatible 2400 baud internal modem

This well designed and solidly built IBM compatible modem offers 2400bps performance at an incredibly low price. Made in the U.S.A and packed with features, this modem is an exceptional value.

- 2400/1200/300bps operation
- Includes Mirror II communications software
- Automatic answer/dial/redial
- Call progress monitoring
- Can be configured as COM1, COM2 or COM3
- Second phone jack for voice communications

PRO-24I **\$129.95**

 **PROMETHEUS**



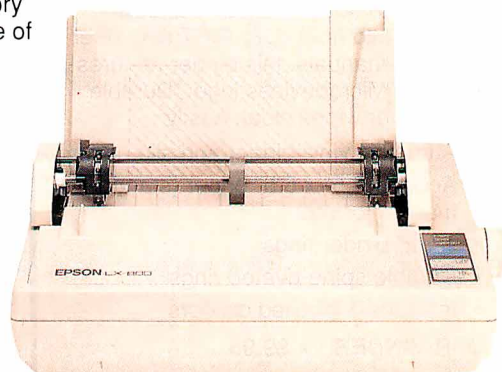
Epson printers

Epson LX-800

Affordable high performance! With its quick printing speed, built-in memory buffer and convenient paper-handling features, the LX-800 represents one of the finest printer values in its class.

- 180 CPS draft, 30 CPS NLQ mode
- 3K memory buffer
- Friction feed and tractor feed
- Auto-load for single sheets
- 3 fonts: Draft, Roman & Sans Serif
- Fonts & print mode are selectable from front control panel
- 9-pin dot matrix print head
- Parallel interface (serial optional)

LX-800 \$199.00

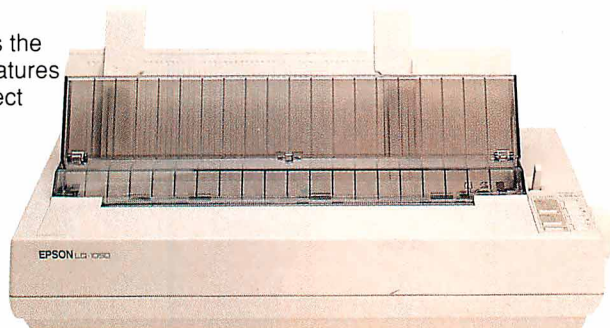


Epson LQ-1050

Built for heavy workloads! This wide-carriage model handles the toughest print job with ease. It's very fast, very quiet, and features push-button paper handling. Simply press one button to select between fan-fold, single sheet, forms or envelopes.

- 24-pin dot matrix print head
- 264 CPS draft, 88 CPS letter quality
- 6K memory buffer
- Prints up to 132 columns
- 3 fonts: Draft, Roman, & Sans Serif
- Tractor feed & friction feed
- Auto load for single sheets
- Parallel and serial interfaces
- Options include font modules, a sheet feeder & a 32K print buffer

LQ-1050 \$999.00



Visit our retail store:

1256 S. BASCOM AVE, SAN JOSE, CA
(408) 947-8881 M-F 9-7, SAT 9-5, SUN 12-4

Epson LQ-500

An exceptional value! Using a 24-pin print head and bidirectional text and graphics printing, the LQ-500 is able to print even letter quality documents at a high rate of speed. Ideal for business, home and student use.

- 24-pin print head
- 180 CPS draft, 60 CPS letter quality
- 8K memory buffer
- Tractor feed & friction feed
- Auto-load for single sheets
- Parallel interface (serial optional)
- 3 fonts: Draft, Roman, & Sans Serif
- Optional font modules & sheet feeder available

LQ-500 \$399.00

Epson LQ-850

Lightning fast! Every office could use one of these printers. The LQ-850 has an extremely fast print speed of 264 CPS — just what you need for high volume work. And it does all this at a very quiet 55 decibels.

- 24-pin dot matrix printer
- 264 CPS draft, 88 CPS letter quality
- 6K memory buffer
- 3 fonts: Draft, Roman, & Sans Serif
- Pushbutton selection of font & pitch
- Bidirectional in text & graphics mode
- Tractor feed & friction feed
- Auto load for single sheets
- Parallel and serial interfaces
- Options include font modules, sheet feeder & 32K printer buffer

LQ-850 \$699.00

Epson EX-800

This is one of the fastest 9-pin printers available! It prints at 300 CPS in draft mode, and in letter quality mode, the EX-800 is more than twice as fast as a daisywheel printer. This printer is built for performance!

- 300 CPS draft, 50 CPS NLQ
- 8K memory buffer
- 3 fonts: Draft, Roman, & Sans Serif
- Bidirectional in text mode
- Tractor feed & friction feed
- Auto load for single sheets
- Parallel & Serial interfaces
- Emulates Epson or IBM Proprinter
- Options include image scanner, sheet feeder & 32K print buffer

EX-800 \$579.00

Order Toll Free: 800-538-5000 LOCAL (408) 866-6200
FAX (408) 378-8927

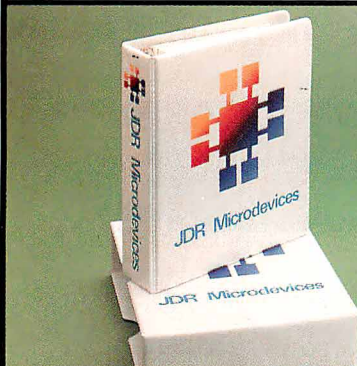
Stocking Stuffers

Binder for your manuals

One binder for all of your manuals! Designed to hold JDR, MCT and other product manuals, this binder features the JDR Microdevices logo. Durable vinyl cover wipes clean easily.

- Attractive vinyl binder and slip-cover
- Accepts 8.5" x 5.5" paper (standard manual format)
- 1 1/2" binder rings
- Durable spine-riveted rings
- Includes 5 labelled dividers

JDR-BINDER \$9.95

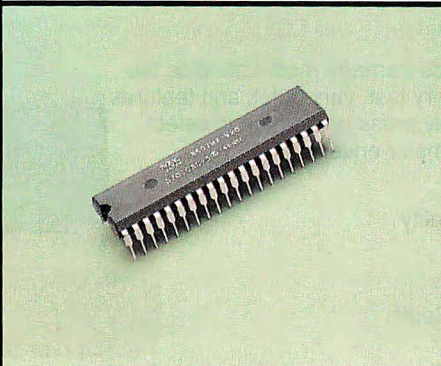


Supercharge your XT

Replacing the 8088 microprocessor in your XT or compatible with the more efficient NEC V-20 can improve performance up to 30%. The V-20 is functionally identical to the 8088.

- Pin compatible with 8088
- Uses superset of 8088 instructions
- High speed address calculation in hardware
- CMOS design requires less power

V20	4.77 Mhz	\$8.95
V20-8	8 Mhz	\$10.95
V20-10	10 Mhz	\$12.95



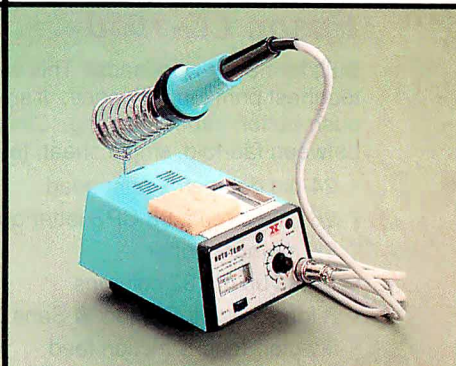
Soldering station

With precise temperature controls and accurate heat sensing for fine PCB work, this soldering tool is suitable for the hobbyist or professional technician.

- UL approved
- Thermostatically controlled heat
- Adjustable temperature setting
- Range 200° - 900°F
- Quick heating & recovery
- Power-on & Heater-on LEDs
- Replaceable solder tip

168-2C \$49.95

168-TIP Replacement tips \$2.95

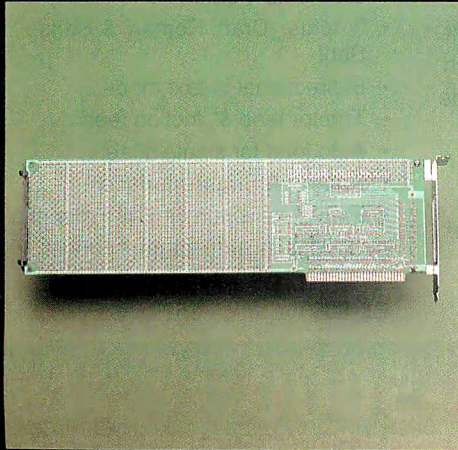


8-bit prototype card

Decode support for a wide range of applications! The PR2 provides decode & buffering circuitry. Use as designed, or modify to suit your application.

- XT compatible
- Buffering & decode circuitry
- Silk screened labels on both sides
- Labelled component & test points
- +5V and ground planes,
- All holes plated through
- Projects & instructions for beginners

JDR-PR2 \$29.95

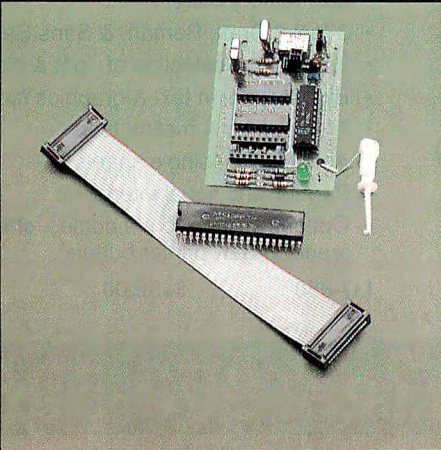


PC accelerator

The Nickel Express improves the performance of your PC! By installing this inexpensive device you can make your PC, XT or clone run up to 67% faster. Requires no slot and is easy to install within a few minutes.

- 3 different operating speeds for maximum compatibility
- Super-fast NEC V20-8 processor
- Turbo switch
- Speed-change software
- Includes mounting bracket & cable

NICKEL-X \$69.95

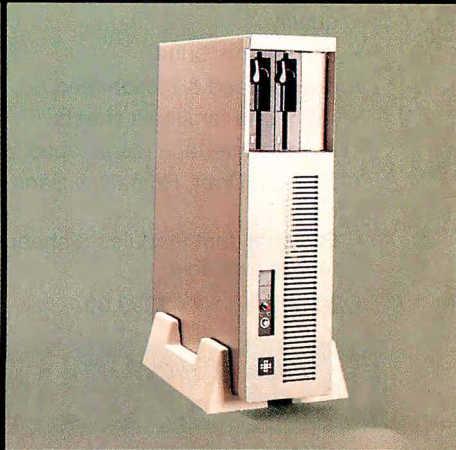


Computer Floor Stand

A great way to reduce desk clutter! This floor-mount stand enables you to move your computer from your desktop, freeing valuable desk space. It has a wide, sturdy base, and fits virtually every standard PC case.

- Attractive beige design
- Fits PC/XT and PC/AT CPU cases
- Designed for 4 to 7-1/2" case widths
- Rugged plastic construction
- Easy to assemble/disassemble

CASE-STAND \$19.95



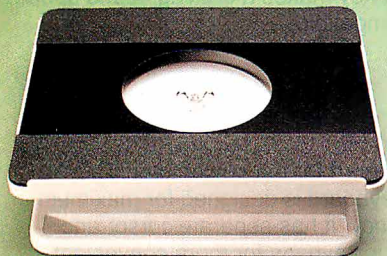
Smart solutions

Monitor Stand

Compute in comfort! This swivel-tilt stand lets you position your monitor at just the right angle for you. No more sore muscles and eye strain due to bad viewing angles. A great gift idea.

- Sturdy ABS plastic construction
- Adjustable tilt and swivel base
- Can be locked in one position or allowed to swivel
- Padded base protects your monitor
- Base dimensions: 11" x 10"

MS-100 \$12.95



Stand & Power Station

Centralized power for your whole system! This stand provides one location for all the power outlets you need. Control your computer, printer, monitor and other peripherals with individual outlet switches, or simply use the master switch for everything.

- Adjustable tilt-swivel base
- Five individually controlled sockets
- 15-amp circuit breaker and line protection circuitry
- UL approved

MS-200 \$39.95

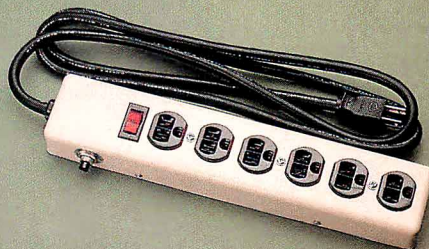


Surge protector

This sturdy power strip has six outlets for your computer and peripherals. If you plug it into your computer power supply using the CBL-PS-MNTR cable, you can control your computer, monitor, printer, and other peripherals with your computer's power switch.

- UL approved
- 15 Amp circuit breaker
- Surge protection circuitry
- 5-foot power cord

POWER-SURGE \$12.95
CBL-PS-MNTR \$3.95

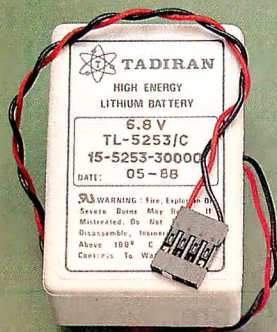


Long life battery

Install this long-lasting lithium battery in your AT compatible or 386 computer! It has a longer life than ordinary batteries and is much more reliable. Plus, it's small enough to be installed virtually anywhere in your computer.

- 6.8 volts
- Lithium for longer life
- Adhesive/velcro mounting strip
- Includes wiring & connector for motherboard battery pins

LITHIUM 6.8V \$11.95



Printer Stand

You'll want two of these—one for home, one for your office! This stylish printer stand helps reduce the clutter around your desk. It provides a raised surface for your printer, so you can put your fan-fold printer paper directly (and neatly!) beneath the printer.

- Large enough for wide-carriage printers
- Attractive smoky brown acrylic
- 4 rubber pads protect desk surfaces
- Approx. 23-1/2" x 11-3/4" x 3-7/8" H

YU-S22B \$49.95



Keyboard Drawer

Increase your desk space! This clever keyboard storage drawer fits under your computer and allows you to simply slide your keyboard out of the way when not in use.

- Sturdy metal housing with slide-out drawer
- Drawer fits all standard keyboards
- Provides a large base for computer & monitor
- 15-1/2" x 24" x 4" H

YU-E21B \$49.95



Order Toll Free: 800-538-5000

LOCAL (408) 866-6200
FAX (408) 378-8927

Keyboards

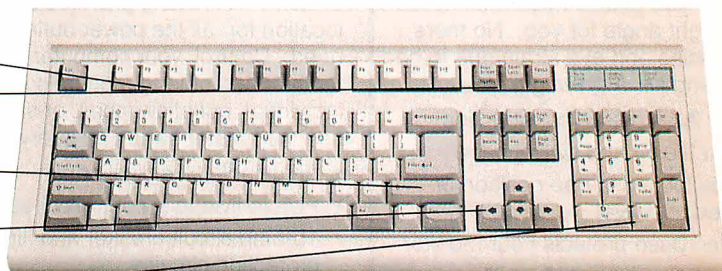
12 function keys

Lighted Num, Caps and Scroll Lock

Large Shift & Return keys

Separate cursor keypad

Separate numeric keypad



New! Enhanced keyboard with a "click"

Sounds and feels like a typewriter! This "key-click" keyboard is designed for those who miss their old typewriter keyboard. Each key makes a clicking sound upon the completion of a keystroke. XT and AT compatible.

K103-A

\$84.95

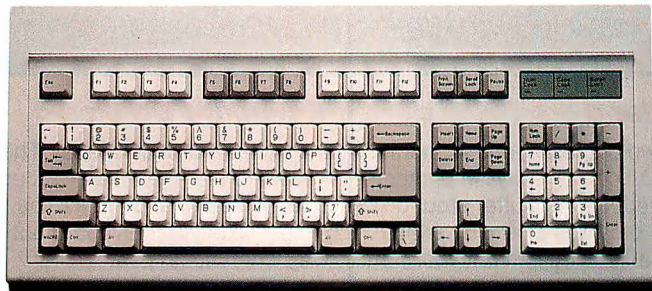
BTC enhanced keyboard

A keyboard for the power user! This 101 key keyboard is designed for maximum efficiency. It has separate cursor and numeric keypads for more convenient cursor movement and number entry.

- XT and AT compatible
- New enhanced layout
- Separate cursor & number keypads
- 12 function keys
- Large shift and return keys
- LED indicators for scroll, caps, and number lock.
- Automatically adjusts to XT or AT
- Auto-repeat feature

BTC-5339

\$79.95



BTC standard keyboard

Just like IBM's original AT keyboard! This 84-key keyboard has the same compact layout as the IBM AT keyboard. This makes it ideal for the many software programs that were designed for this keyboard.

- XT and AT compatible
- Automatically adjusts to XT or AT
- 84-key AT style layout
- 10 function keys
- Extra large Shift & Return keys
- LED indicators for Scroll, Caps & Number lock
- Auto-repeat feature

BTC-5060

\$59.95



Visit our retail store:

1256 S. BASCOM AVE, SAN JOSE, CA
(408) 947-8881 M-F 9-7, SAT 9-5, SUN 12-4

Graphics

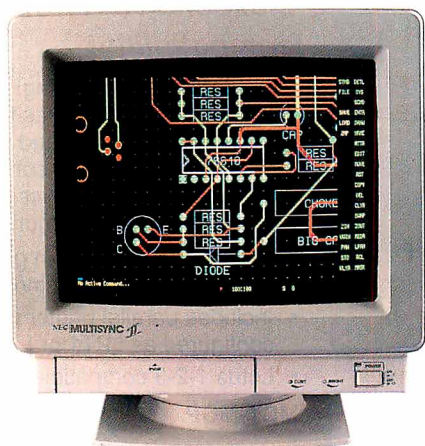
VGA Compatible Package

This VGA display system offers an unbeatable combination of color and clarity—with it, you can display a vivid array of up to 256 colors simultaneously! Other modes support 800 x 560 or the standard 640 x 480 in 16 colors from a palette of 64 colors. In addition to its color and clarity, this VGA system offers full compatibility with IBM's VGA. Consisting of a fully compatible VGA card from ATI, and a professional graphics analog monitor, the VGA system offered by JDR Microdevices is now available at a price comparable to EGA display systems.

- 640 x 480 in sixteen colors for VGA compatibility
- 320 x 200 with 256 colors from a palette of 262,000
- SoftSense Automatic Mode switching for transparent downward capability with EGA, CGA, Monochrome & Hercules graphics
- Comes with support & drivers for 1-2-3, Symphony, Windows, GEM & AutoCad
- User friendly manual with step-by-step instructions
- Includes Mode Switching, Screen Saver & Diagnostics software

VGA-PKG

\$649.95



Sigma VGA Board

Here's an intelligent graphics card that offers a universal solution to the multiple PC display standards. It supports nearly all the current IBM PC and PS/2 display modes and monitors, and it's 100% hardware compatible in all modes. The SIGMA VGA is ideal for the NEC Multisync II.

- 100% register compatible
- VGA, EGA, CGA, HGC & MDA compatible
- 320 x 200 in 256 colors
- 640 x 480, 800 x 600 in 16 colors
- 80 x 25, 132 x 44 text modes
- Supports all standard digital & analog monitors (9 & 15 pin)

SIGMA-VGA

\$297.50



NEC multisync II monitor

Breathtaking color display! You'll be hard pressed to find a better monitor—at any price. The Multisync has a remarkably clear display with crisp, distinct colors and is ideal for graphics-intensive applications like CAD, CAM, & windows.

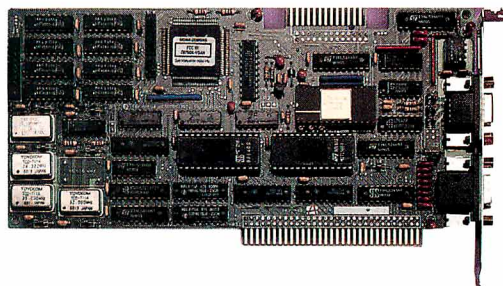
- Super-sharp resolution (800 x 600 max)
- Compatible with VGA, MCGA, PGC, EGA, Hercules, CGA & other display adapters
- Automatically adjusts to any standard display adapter
- Front-mounted power, brightness & contrast switches
- Monochrome text mode & text color switches (green, amber & white)
- 9-15 pin adapter for PS/2 computers

NEC-MULTI

\$599.95

"...if I were in the market today for a VGA board, the Sigma VGA would be my choice."

— Curtis Franklin Jr., BYTE, March 1988



Order Toll Free: 800-538-5000

LOCAL (408) 866-6200
FAX (408) 378-8927

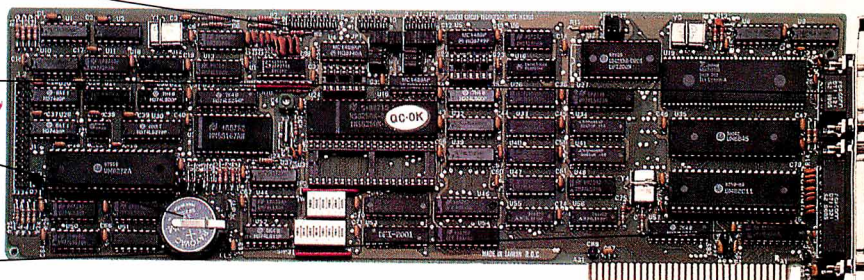
Peripheral cards

Supports 2 floppy drives—360K or 720K
(includes cables)

Parallel, serial, & game ports with
socket for optional 2nd serial port

Clock-calendar, battery, & RAM disk
software

Hercules compatible monographics
High resolution (720 x 348 pixels)



MODULAR CIRCUIT TECHNOLOGY

Graphics, floppy control and I/O in one card!

The only card your XT compatible computer needs! This card is almost a computer in itself: it provides monochrome graphics, support for two floppy drives, a clock-calendar, a parallel port, a serial port, and a game port. All you need is this card and a motherboard for a fully functional computer.

MCT-MGMIO

\$119.95

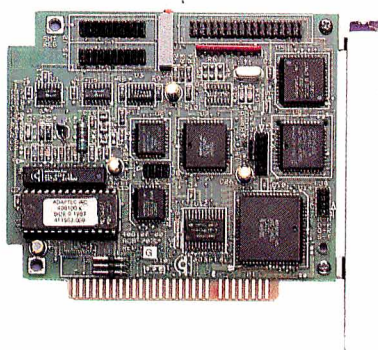
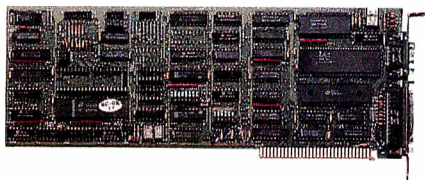
286/386 display and I/O control using one slot!

Create a complete system using only two cards! Use this "do everything" card to hook up a monochrome monitor, parallel printer, modem, and game joystick at the same time. The only other card your system needs is a floppy//hard controller.

- AT compatible
- Hercules compatible monographics
- High resolution display (720 x 348 pixels)
- 80 & 132 column text modes
- Serial port (w/ optional 2nd serial port)
- Parallel port & game port
- Includes software for running color graphics programs on a monochrome monitor

MCT-MGAIO

\$99.95



Add inexpensive color to your computer!

Great for home computing! This card has the versatility you need-- it works with monochrome or color monitors (RGB), displays a medium resolution for graphics or a higher resolution for text, plus it displays up to 4 colors for computer games.

- Two display modes: monochrome (640 x 200) and color (320 x 200)
- Works with monochrome or RGB monitors
- Light pen interface
- XT and AT compatible

MCT-CG

\$49.95

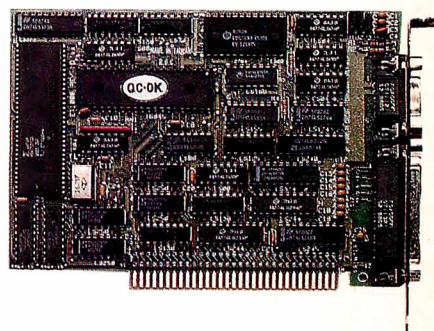
Inexpensive Hercules compatibility!

Great for word processing! Our monochrome graphics card has true Hercules compatibility and uses VLSI chips for reliability. The software driver allows most color graphics programs to run on a monochrome monitor.

- 720 x 348 resolution in graphics mode, 80 x 25 in text mode
- Includes parallel printer port configured as LPT1 or LPT2
- Lotus 1-2-3 compatible

MCT-MGP

\$59.95



Visit our retail store:

1256 S. BASCOM AVE, SAN JOSE, CA
(408) 947-8881 M-F 9-7, SAT 9-5, SUN 12-4

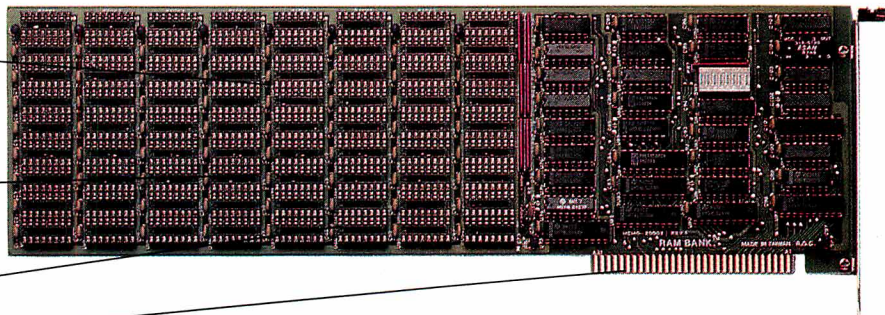
Modular Circuit Technology

2MB RAM capacity (ØK installed) for expanded or part expanded/part conventional memory. Accepts 64K or 256K DRAM chips

Conforms to LIM EMS version 3.2 Software for EMS drivers, RAM disk & more

Compatible with Lotus 1 2 3

XT compatible



Add memory to your XT compatible!

Go beyond the limits of 640K! This card provides additional RAM for improved performance. It allows you to add up to 2 megabytes of RAM (ØK installed) — ideal for the fast RAM disks and disk caches you need to speed up your computer's operation.

MCT-EMS		\$129.95
MCT-AEMS	286/386 version	\$139.95

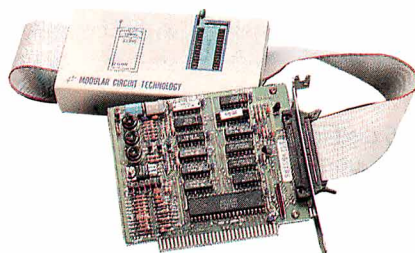
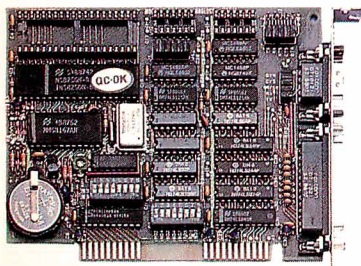
MODULAR CIRCUIT TECHNOLOGY

Serial/parallel ports plus clock/calendar

Combines I/O ports with a clock-calendar! The MCT-IO adds parallel and serial ports to your XT compatible system, and a clock-calendar that keeps the right time and date—even when your computer is turned off.

- Parallel port is addressable as LPT1 or LPT2
- Serial port is addressable as COM1, COM2, COM3, COM4
- Socketed for optional 2nd serial port
- Selectable port addresses
- Real time clock/calendar & battery
- Includes software for RAM disk and clock

MCT-IO	\$59.95
IO-SERIAL 2nd serial port	\$24.95



Easily program your own EPROM's

Our best selling EPROM programmer supports various manufacturers' formats with 12.5, 21 and 25 volt programming. The menu-driven software allows you to easily manipulate data files, split or combine the contents of several EPROMs and perform many functions with just a single keystroke.

- Read, Write, Copy, Erase, Check & Verify with one easy key selection
- Includes software for standard Hex and Intel Hex formats
- Programs 27xx & 27xxx series EPROMs up to 27512

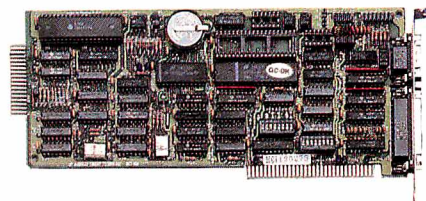
MCT-EPROM **\$129.95**

I/O and floppy control in one card!

Combines controller & I/O functions! This card does a lot of things at once: it controls your floppy drives, provides parallel, serial & game ports for your printers, modems, mice & joysticks; and it even has a clock-calendar to help your computer keep the right time.

- XT compatible
- Supports two floppy drives
- Parallel port
- Serial port (2nd serial port optional)
- Game port
- Includes floppy drive cables and DB9-DB25 converter
- Clock-calendar with battery
- Includes software for RAM disk and more

MCT-MIO	\$79.95
MIO-SERIAL 2nd serial port	\$15.95



Order Toll Free: 800-538-5000 LOCAL (408) 866-6200
FAX (408) 378-8927

Test equipment

The ultimate hand-held multitester

This full function 3.5 digit DMM offers highly accurate performance and a host of added features like audible continuity, capacitance, transistor, temperature, and conductance to help you do the job— fast. Temperature probe, test leads and battery included.

DMM-300 \$79.95

Fully overload protected

Transistor Tester:
0° - 2000°F

9 functions, 34 ranges

Conductance Tester: 200ns range

Temperature Tester: 0° - 2000° F



**2 YEAR
REPLACEMENT WARRANTY ON
ALL JDR INSTRUMENTS
PRODUCTS!**

Basic DC accuracy: plus/minus 0.25%

DC Voltage: 200mv - 1000v, 5 ranges

AC voltage: 200mv - 750v, 5 ranges

Resistance: 200 ohms - 20M ohms, 6 ranges

Capacitance: 2000pf - 20 uf, 3 ranges

Input impedance: 10M ohm.

Full function DMM

Get highly accurate performance from this 3.5 digit full function DMM at a very affordable price. Rugged construction, 20 amp current capability and 22 ranges make it a perfect choice for serious field or benchwork. Low battery indicator and tilt-stand, Probes and 2000 hour battery.

- Basic DC accuracy: $\pm 0.25\%$
- DC voltage: 200mv - 1000V, 5 ranges
- AC voltage: 200mv - 750V, 5 ranges
- Resistance: 200 ohms - 20M ohms, 6 ranges
- AC/DC current: 200uA - 20A, 6 ranges
- Input impedance: 10M ohm
- Fully overload protected
- Approx. 7" x 3-1/2" x 1-1/2" Wt. 11 ozs.

DMM-200 \$49.95



3.5 digit probe DMM

Custom 80 pin LSI chip provides accuracy and reliability in a very compact size. Autoranging, audible continuity and data hold features help you pinpoint the problem quickly. Case and batteries included.

- Basic DC accuracy $\pm 1\%$
- DC voltage: 2V - 500V, autoranging
- AC voltage: 2V - 500V, autoranging
- Resistance: 2K ohms - 2M ohms, autoranging
- Fully over-load protected
- Input impedance: 11M ohm
- Approx 6 1/2" x 1" x 3/4"
- Weighs under 3 ozs.

DPM-1000 \$54.95



Pocket size DMM

Perfect for the field service technician. Shirt pocket size doesn't compromise features or accuracy. Large, easy to read 1/2" LCD display. Fully overload protected for safety. 2000 hour battery life with standard 9V cell. Probes and battery included.

- Basic DC accuracy: plus/minus 0.5%
- DC voltage: 2V - 1000V, 4 ranges
- AC voltage: 200V - 750V, 2 ranges
- Resistance: 2k ohms - 2M ohms, 4 ranges
- DC current: 2mA - 2A, 4 ranges
- Input impedance: 10M ohm
- Fully overload protected
- Approx. 5" x 3" x 1". Under 7 ozs.

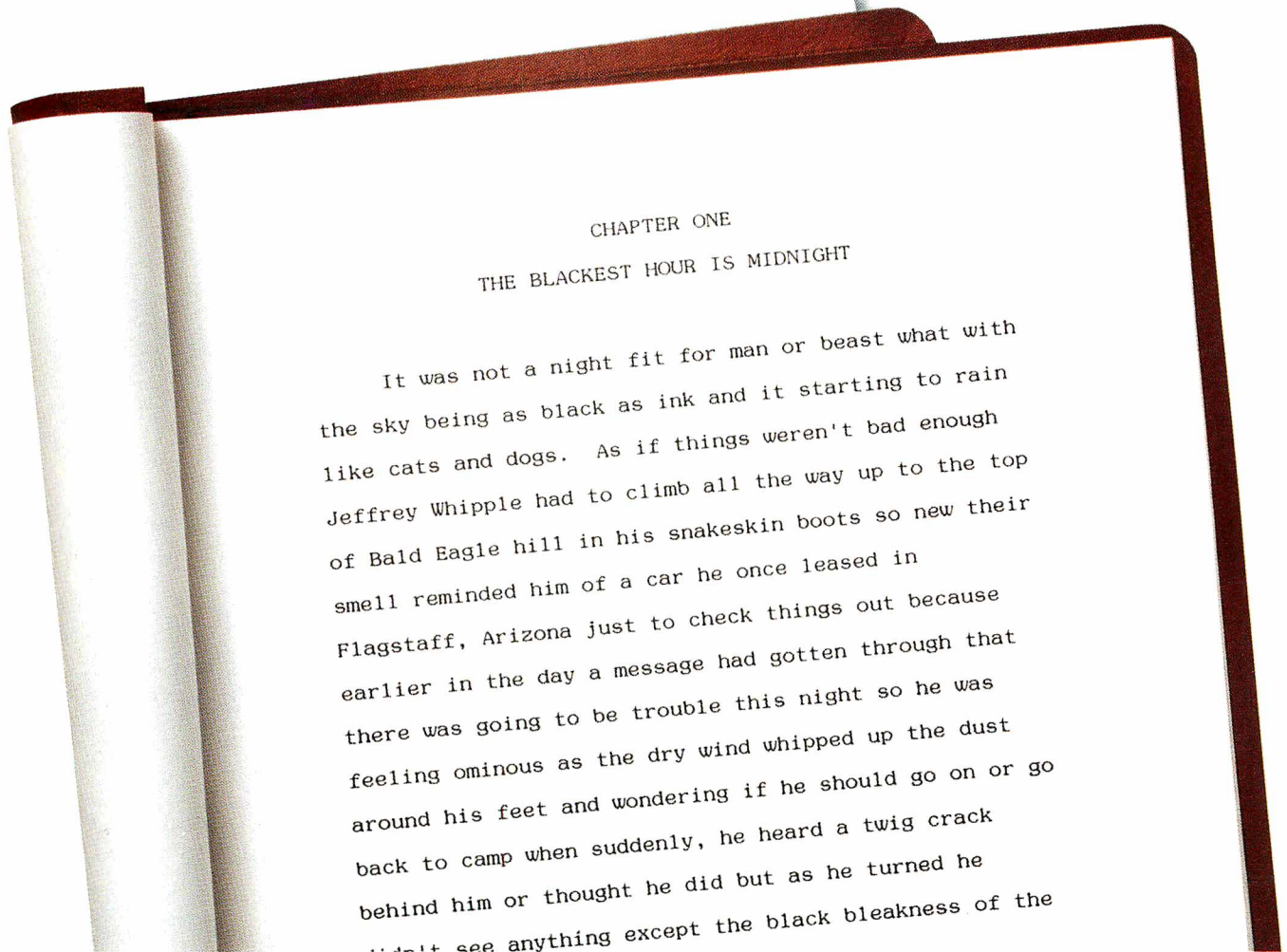
DMM-100 \$29.95



Order Toll Free: 800-538-5000

**LOCAL (408) 866-6200
FAX (408) 378-8927**

OUR NEW PRINTERS MAKE EVEN BAD WRITING LOOK GOOD.



We're sorry that our new 24-wire Pinwriter® P5200 and P5300 printers can't do much for the quality of your writing. But they can certainly do wonders for the way it looks. The secret is the ribbon. Other dot matrix printers only use a fabric ribbon. Our Pinwriters print with both a fabric and a letter-quality, multi-strike film ribbon—the same kind used on executive typewriters.

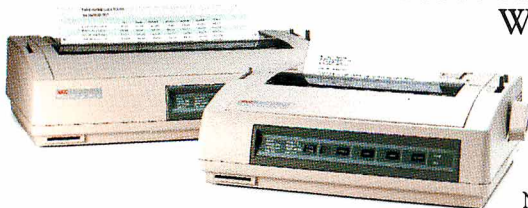
The NEC Pinwriters can also enhance your writing in other ways. They have seven resident type styles. Plus four more are available on plug-in font cards. Which means you can express your thoughts with just the right typeface. You can also get an inexpensive, user-installed color option. And if graphics are part of your story, these Pinwriters produce the highest resolution of any printer you can buy.

Call NEC Information Systems at 1-800-343-4418 to see how much better our new Pinwriter P5200 and the wider P5300 can make your writing look.

Whether you're a budding Hemingway, or a Hemingway & Company.

**NEC PRINTERS. THEY ONLY STOP
WHEN YOU WANT THEM TO.**

NEC



NEC Information Systems, Dept. 1610, 1414 Massachusetts Ave., Boxborough, MA 01719.

Tandy® Computers: The broadest line of PCs in America.



The Tandy 5000 MC

Our most
powerful 386™
based computer
...made in America.

The new Tandy 5000 MC Professional System is pure performance, from the Intel® 80386 processor operating at 20 MHz to the memory cache controller that provides RAM-fast access to data.

With the 5000 MC, you have the high-performance platform needed to take the fullest advantage of industry-standard MS-DOS® applica-

tions, powerful new MS® OS/2 programs or multiuser SCO® XENIX® software.

Operating at 20 MHz, the 5000 MC cuts through the big jobs like database management, large spreadsheets and sophisticated graphics. Its IBM® Micro Channel™ compatible architecture allows multiple processors to use the same bus.

The system architecture also provides a radical increase in data-transfer rates when the Tandy 5000 MC is configured within a 3Com® workgroup or a multiuser environment.

The Tandy 5000 MC is the new alternative in personal computing—from the best-selling family of PC Compatibles made in America.

Tandy Computers: Because there is no better value.™

Intel/Reg. TM Intel Corp. IBM/Reg. TM and Micro Channel/TM IBM Corp. MS, MS-DOS and XENIX/Reg. TM Microsoft Corp. SCO/Reg. TM The Santa Cruz Operation. 3Com/Reg. TM 3Com Corp.

Radio Shack®
COMPUTER CENTERS
A DIVISION OF TANDY CORPORATION

Circle 238 on Reader Service Card